

# AN ANALYSIS OF VARIATION IN THE HISPANIOLAN GIANT ANOLE, *ANOLIS RICORDI* DUMÉRIL AND BIBRON

ALBERT SCHWARTZ<sup>1</sup>

**ABSTRACT.** The nominal Hispaniolan species of giant anole, *Anolis ricordi*, is considered to be in actuality composed of three distinct allopatric species: *A. ricordi*, *A. barahonae*, and *A. baleatus*. Subspecies of all three species are described, but only *A. baleatus* is well represented in collections. A theoretical history of this species complex upon Hispaniola is presented.

The Hispaniolan giant anole, *Anolis ricordi* Duméril and Bibron, 1837, has been known to science for more than a century; yet only in the last 35 years has it become evident that this species is not homogeneous in its characteristics throughout Haiti and the República Dominicana. The species was first named (as *Anolis ricordii*) from Santo Domingo, as the entire island was known at that historical period, but specimens seem to have been rare in collections thereafter. Schmidt (1921: 10) reported four *A. ricordi* from two Dominican localities. Cochran (1941: 133) listed 24 specimens (all but one of which were in the National Museum of Natural History) from 11 localities. Mertens (1939: 68-70) studied 17 specimens in European collections and was the first to recognize that there were two readily distinguishable populations that he considered subspecies: *A. r. ricordi* in Haiti, and *A. r. baleatus* Cope in the República Dominicana. Williams (1962) reviewed the species in more detail and examined 90 specimens. For this suite of anoles, he described *A. r. barahonae*

from the Sierra de Baoruco in the southwestern República Dominicana. Still later, Williams (1965) studied an additional 80 specimens and named *A. r. leberi* from Camp Perrin on the extreme distal portion of the Haitian Tiburon Peninsula. Thus, with increasing quantities of material from more diverse localities, our knowledge of the distribution and variation in this species has increased accordingly.

A great many problems remain, however, when one deals in detail with the variation in *A. ricordi*. Williams (1962, 1965) pointed out that records of the species were of such a scattered nature (especially on the Tiburon Peninsula but also elsewhere on the island) that intergrades between several of the subspecies remained unknown and also that there were no specimens available from large areas between named populations. Williams and Rand (1969), in their excellent summary of the geographic differentiation in all species of Hispaniolan anoles, pointed out (p. 15) that *Anolis ricordi* was composed of "several described subspecies, some of which are sharply enough distinct to raise the question of possible species status." This is most especially true of the taxa *ricordi*, *baleatus*, and *barahonae*, all of which are extremely well characterized by both pigmental and structural details, but all of which occupy areas (extensive in the cases of *ricordi* and *baleatus*) without known intergradation between them or without close geographic approximation. Thus, the closest ap-

<sup>1</sup> Miami-Dade Community College, Miami, Florida 33167.

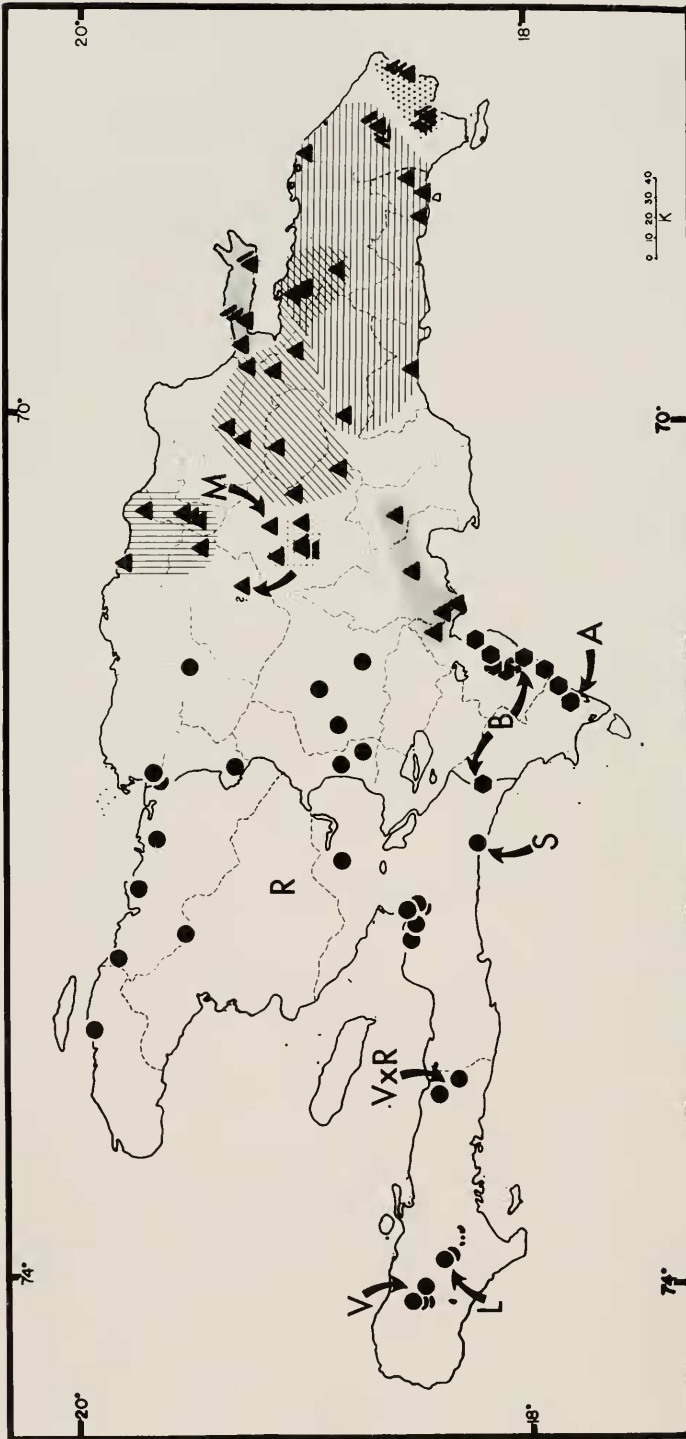


Figure 1. Map of Hispaniola, showing the known distributions of the Hispaniolan giant anoles, as follows. *Anolis ricardi*—solid circles; *Anolis barahonae*—solid hexagons; *Anolis baletatus*—solid triangles. All solid circles other than those marked individually are *A. r. ricardi* = R; V = *A. r. viculus*; L = *A. r. leberis*; S = *A. r. subsolanus*; V x R = intergrades between *A. r. viculus* and *A. r. ricardi*. B = *A. b. barahonae*; A = *A. b. albocellatus*. Subspecies of *A. baletatus*: *baletatus*—broad vertical lines; *caeruleolatus*—broad diagonal lines; *samanae*—fine stippling; *multistrupus* = M; *sublimis*—moderate stippling; *scelustus*—broad horizontal lines; *litorisilva*—coarse stippling; *fraudator*—fine diagonal lines. Overlap of symbols represents area of intergradation. Questioned locality is specimen from Las Mantones which may be *A. b. sublimis*.

proaches of the ranges of *ricordi* and *baleatus* (Copey and Peña, both in the República Dominicana) are separated by some 115 kilometers airline. The subspecies *barahonae* and *ricordi* (Sierra de Baoruco and associated eastern coastal areas in the República Dominicana, and Saltrou in Haiti) are known from localities separated by about 115 kilometers, and *barahonae* and *baleatus* by a gap of about 115 kilometers (between the Sierra de Baoruco and near Villa Altagracia, both in the República Dominicana).

Schwartz and Garrido (1972) recently showed that the Cuban giant anole, *Anolis equestris* Merrem, is, in fact, a complex of five species; they also suggested (p. 71) that, as Williams and Rand had pointed out, there was a good possibility that the Hispaniolan *Anolis ricordi* in time might likewise be shown to be a complex of species. It is the purpose of the present paper to discuss the variation in *A. ricordi*, based upon the examination of 403 specimens from a broad selection of geographic localities throughout Hispaniola. Despite my having studied far more material than any previous investigator, there still remain many problems that cry out for solution. As Schwartz and Garrido also pointed out in their analysis of *Anolis equestris*, the present paper in no way should be considered as the final word on *A. ricordi*; rather it is an attempt to comment in detail upon the known variation and distribution of this species in Hispaniola which may serve as a stepping stone for further work upon the species.

Between 1962 and 1971, I and my associates collected extensively in both Haiti and the República Dominicana. Latterly, between 1968 and 1971, my work in Hispaniola has been under the sponsorship of two National Science Foundation grants, GB-7977 and B-023603. Specimens of *Anolis ricordi* collected in 1962-63 were available to Williams and were reported upon by him (1965); in fact, the long series of *A. ricordi* from Camp Perrin, Haiti, secured for me by native collectors in 1962, was the

material upon which *A. r. leberi* was based. Our unique experience at Camp Perrin—namely, of many *A. ricordi* received from local Haitians—showed that the species may not be necessarily rare. However, as in *A. equestris* in Cuba, the cryptic greens of *A. ricordi* render the species virtually invisible during the day except to all but the most experienced observer. In 1963, Richard Thomas discovered that *A. ricordi* might be secured at night, since individuals sleep quite exposed in a variety of arboreal situations and are very conspicuous. Thus, with the knowledge that the *agrama* (as the species is known in Haitian Creole) or the *saltacocote* (as the species is known in Dominican Spanish) might be common and thus easily secured by native collectors, and that individuals might be readily secured at night while they slept, I had as one of my objectives to secure as many *A. ricordi* as possible in order to clarify the status of the named subspecies and in an attempt to narrow the geographic gaps that seemed to exist between *ricordi*, *baleatus*, and *barahonae*. As more material accumulated, we were successful in the latter attempt, but the range of variation in newly acquired material showed that the situation was more complex than was supposed. In addition to specimens in the Albert Schwartz Field Series (ASFS), collected by myself and field assistants, I have examined material in the American Museum of Natural History (AMNH), the Museum of Comparative Zoology (MCZ), and the National Museum of Natural History (USNM). For the loans of specimens I am grateful to Richard G. Zweifel, George W. Foley, Ernest E. Williams, and George R. Zug. In all of these collections there are other specimens that I have deliberately not elected to study, since many of them are from localities that are now well represented by more recently collected lizards or that have poor locality data. Specimens in the collection of the Museum of Comparative Zoology have been collected under NSF grant B-019801X and previous grants to Dr. Williams. Most of the re-

cently taken ASFS *A. ricordi* have detailed descriptions of color and pattern in life, but, as in all such endeavors that span several years, it is unfortunate that *all* details of color and pattern have not been consistently recorded as time has passed. Likewise, there are no color or pattern data on most old specimens; thus, I feel less secure in dealing with these older specimens or those collected by others than myself and parties than I am with those in the ASFS which are carefully documented. However, specimens from other localities must in some way be dealt with, and I have done so as carefully as possible, considering details of geography and what is known about specimens of *A. ricordi* from adjacent localities.

I wish to acknowledge with enthusiasm the efforts on my behalf in the field of the following men, without whose efforts the quantity of *A. ricordi* presently available to me would be far less: Jeffrey R. Buffett, Carl Butterfield, James R. Dennis, Danny C. Fowler, Ronald F. Klinikowski, David C. Leber, James A. Rodgers, Jr., Bruce R. Sheplan, and Richard Thomas. C. Rhea Warren has given me a specimen of *A. ricordi* from northern Haiti. My notes on coloration and pattern of *A. ricordi* have been greatly supplemented during the present study by the color portraits executed in the field by D. C. Leber; one of these has been reproduced in black-and-white in Williams (1965), but the reproduction hardly does justice to the detailed beauty of all the originals. I have been able to examine the holotype of *Eupristis baleatus* Cope through the courtesy of Alice G. C. Grandison and A. F. Stimpson of the British Museum (Natural History). Holotypes and paratypes have been designated or deposited in the above collections and in the Carnegie Museum (CM).

### THE PROBLEM

Mertens (1939) was the first to point out that Haitian and Dominican *A. ricordi* differed from each other in one notable character—the height of the dorsal crest scales.

His figure 41 shows this character extremely clearly: in nominate *ricordi* from Haiti, the nuchal crest scales are low and inconspicuous, whereas in Dominican *baleatus* the nuchal crest scales are long and attenuate. In addition, Mertens (1939: 69) characterized *ricordi* as having 9 to 12 scales between the eyes; males of this subspecies have one or more sharply defined black blotches on the sides of the nape, the occipital area flecked with black, and often have black longitudinal stripes on the flanks. On the other hand, *baleatus* has from 6 to 8 scales between the eyes, and males are without any black head, nape, or lateral markings. Williams (1962) compared these two taxa with *barahonae* in regard to four characters: height and relative length of nuchal and dorsal crest scales, number of snout scales at the level of the second canthal scale, and body pattern. Later, when he described *A. r. leberi*, Williams (1965) employed these same characters to differentiate that subspecies.

The differences in these characters between the four recognized subspecies are unequivocal: one can differentiate at a glance between such distinctive animals as *leberi* and *barahonae* or between *ricordi* and *baleatus*, without recourse to microscopic examination. The whole aspects of all four taxa are quite distinctive, whether one is dealing with living or long-preserved animals. What has been equivocal is the relationships of these four taxa, since, as I pointed out previously, they have been known from rather isolated groups of localities, widely separated from each other. In only one case (*leberi-ricordi*) have specimens been regarded as intergradient between two subspecies: these intergrades are from a geographically plausible locality that itself is widely removed from the two "parent" populations.

As material has gradually accumulated, it has become increasingly obvious that the situation is even more complex than has been previously recognized. For example, in 1971, I had occasion to compare long series of living examples from the Peninsula

de Samaná and the adjacent "mainland" at Caño Abajo, and I was at once struck with the differences between these two samples, both of which have been regarded as *baleatus*. In this case, the differences are not particularly subtle but they do involve differences in coloration and pattern which often are evanescent after preservation. The same statement may be made about *A. ricordi* from the region near La Vega and those from the Cordillera Septentrional. In 1971 I had occasion to collect specimens from both these regions on two successive days and thus was able to compare freshly collected material directly. Again, the differences are ones of pattern and color, but they are so striking that it is misleading to consider both these populations as being identical genetically. I could multiply the above examples but to no purpose; it is obvious, when one sees living *A. ricordi* in the field, that there are several populations presently assigned to *baleatus* which are quite distinctive.

On the basis of specimens collected by Richard Thomas and myself in 1963, Williams (1965) reported *A. r. ricordi* for the first time from the northwestern República Dominicana in the region near Pepillo Salcedo and Copey in Monte Cristi Province. He noted, however, that, "Despite the new collections one embarrassment remains. No certain intergrades between the two strikingly different forms *ricordii* and *baleatus* are yet known. . . . However, the area in which intergrades may occur is being narrowed: on the north coast of the Dominican Republic between Monte Cristi and Santiago and in the center of Hispaniola between Mirebalais (MCZ 68479, 69404) and Santiago. This still leaves a very wide area of ignorance." Since the above was written, I have secured specimens of the nominate subspecies in four other regions: at Restauración, Dajabón Province, along the Dominico-Haitian border and about 40 kilometers airline south of the Monte Cristi localities; on the southern slopes of the Cordillera Central near Juan de Herrera in San Juan Province; and throughout the Sierra

de Neiba between Hondo Valle and Vallejuelo in La Estrelleta and San Juan provinces. These latter two regions (the southern slopes of the Cordillera Central and the Sierra de Neiba) are separated by the rather xeric Valle de San Juan. Elsewhere to the east and north, the Cordillera Central harbors *A. ricordi* with long nuchal crest scales and without black nape and head markings in males (i.e., = *baleatus*), as at San José de Ocoa, La Vega, and the interior uplands near El Río, and near Los Montones on the Río Bao. The fourth locality is perhaps the most significant; there is one subadult male from Santiago Rodríguez Province near Los Quemados which is clearly a *ricordi*. Of the *baleatus* localities, this one is closest to Los Montones, a distance of 50 kilometers airline. Thus the gap between *ricordi* and *baleatus* in northern República Dominicana has been more than halved, and there still is no genetic influence of one subspecies upon the other.

To the south, specimens of *A. ricordi* from the Sierra Martín García, and Azua and Peravia provinces likewise narrow the gap there between *baleatus* and *ricordi* on one hand and between *baleatus* and *barahonae* on the other. In the former case, the distance between *ricordi* and *baleatus* (Vallejuelo and Sierra Martín García) is about 60 kilometers airline, without character dilution. In the instance of *barahonae* and *baleatus*, only 20 kilometers separate known localities (Barahona and Sierra Martín García) for these two taxa: however, the actual kilometrage is deceiving, since, lying between these localities, is the Valle de Neiba and the Bahía de Barahona. Although this eastern extreme of the Valle de Neiba is rather mesic and supports (or did support) large trees in many areas that would presumably be suitable for *A. ricordi*, the break between these two populations is sharp despite presumably suitable ecology. I have little doubt that *A. ricordi* occurs in this intervening region, and the interaction of *barahonae* and *baleatus* therein will be most interesting to ascertain.

Even more intriguing is the fact that the

Sierra Martín García is an extreme eastern isolate of the Sierra de Neiba, which is elsewhere occupied by *A. r. ricordi*. This small range, which reaches an elevation of 1350 meters, is completely surrounded by extremely arid desert or low rolling xeric hills, as well as by the Bahía de Barahona on its southwestern edges. The herpetofauna of the Sierra Martín García is just becoming known, and it supports a remarkable fauna, including an endemic species of *Diploglossus* (Thomas, 1971) and a new species of *Sphaerodactylus*, as well as other unexpected novelties. Nevertheless, *A. ricordi* seems to have reached this range from the northeast (*i.e.*, the southern slopes of the Cordillera Central), since I regard the Martín García lizards as identical to those from Azua and Peravia provinces.

Finally, the geographic relationship of *barahonae* and *ricordi* has been to some extent clarified. *A. r. barahonae* has been known only from the eastern uplands of the Sierra de Baoruco and from three southern lowland localities (Enriquillo, half-way between Enriquillo and Oviado, and Oviado). Each of the latter localities is represented by a single specimen. The Enriquillo and Enriquillo-Oviado specimens are quite obviously *barahonae*, but, as Williams (1965: 4) noted, the specimen from close to Oviado is quite different in style of pattern and color from typical *barahonae*. To the west, in Haiti, there has been but a single specimen from Saltrou which Williams (1965: 2) considered *A. r. ricordi* and which "narrows the geographic gap between *ricordii ricordii* and *r. barahonae*; however, it does nothing to narrow the character gap." Two additional facts are important. First, in 1971, we secured a pair of *A. ricordi* from along the Dominico-Haitian border north of Pedernales; these individuals, although differing somewhat from typical *barahonae* and strongly from the single Oviado specimen, in no way show any tendencies toward *A. r. ricordi*. They are clearly related to *barahonae*, a rather surprising fact since they are much closer (35 kilometers) to Saltrou

than they are to any *barahonae* locality (65 kilometers at Enriquillo). Secondly, Williams has recently received a fine series of *A. ricordi* from Source Carroyé near Thiotte; these lizards are quite obviously *not A. r. ricordi* but are closer in many ways to the far-western *A. r. leberi*. Thus the situation along the southern Haitian coast between Saltrou and the eastern coast of the República Dominicana at Oviado and its environs remains a true puzzle. It seems likely that *A. r. ricordi* does not cross the high Massif de la Selle, except possibly by some circuitous route, and that *A. r. barahonae* occurs up to the Dominico-Haitian border, to within 11 kilometers of a station (Source Carroyé) where another taxon occurs, without character dilution.

Interpretations of all these facts are seriously hampered by the lack of specimens of *A. ricordi* from throughout the Haitian Tiburon Peninsula. Material from the peninsula may be divided into four basic lots: a short series from the region about Castillon on the northern slopes of the Massif de la Hotte near the tip of the peninsula; a very long series of specimens from Camp Perrin on the low southern slopes of the Massif de la Hotte (the type series of *A. r. leberi*); a short series from midway along the peninsula at Miragoâne-Paillant; and a moderate number of specimens from near the base of the peninsula in the region of Morne Decayette-Pétionville-Port-au-Prince. The lack of material from such well-collected areas as Jérémie on the northwestern coast or Jacmel and Les Cayes on the southern coast is extremely puzzling—we simply know nothing about lowland *A. ricordi* throughout much of the Tiburon Peninsula, except for the above scattered records and the southern coast at Saltrou near the Dominican border (and the latter locality is not even on the peninsula proper).

To summarize the data from elsewhere in Haiti and the República Dominicana, there is a huge distributional hole in central Haiti, with but two specimens (*ricordi*) from Mirebalais, widely separated

from southern *ricordi* at and near Port-au-Prince, and then a group of scattered localities along the northern littoral of Haiti from Port-de-Paix in the west to Terrier Rouge in the east, and one specimen from Marmelade in the interior Chaîne de Marmelade. All these Haitian specimens have low nuchal crest scales, and males variably possess some black nape and side markings, but there are differences between specimens from the various sections which presently defy analysis, since the material is too meagre and from too scattered localities.

The República Dominicana fares far better as far as detailed coverage is concerned. Aside from the material previously noted as assigned to *ricordi* or *barahonae*, there are now good series available from the eastern half of the country, and, although there are certain gaps even within this region, they are not so appalling as are those in Haiti. *A. ricordi* is rarer (or perhaps less easily encountered) in arid regions, and thus the most striking gaps in the western half of the República Dominicana are those involving arid regions on the one hand or high mountain masses on the other. The latter situation, especially if the slopes are pine-clad, does not appear suitable for *A. ricordi*, and the species may be truly absent from the uplands above 4000 feet (1220 meters), the highest elevation from which the species is known. In arid regions, *A. ricordi* appears to be restricted to riverine woods and forests; in such situations, the species may not be uncommon, but it may require diligence to secure even one specimen from a particular region.

The detailed discussion above should give the reader a background of both the history and present knowledge of the distribution of *A. ricordi* against which the following accounts can be most logically followed. One further point is of interest. *A. ricordi* is unknown by specimens from any of the large Hispaniolan satellite islands. In some cases (Isla Beata) the species is not expected for a variety of reasons,

but in others (Ile de la Gonâve, Ile de la Tortue, Ile-à-Vache) there seems no logical reason for the absence of *A. ricordi*, discounting the vagaries of overseas transport. The species does occur on Isla Saona, but remains uncollected there. Fowler and Sheplan saw a sleeping *A. ricordi* on the northern coast of Isla Saona in December 1971, but, after it had been shot, it was lost in the undergrowth. The occurrence of *A. ricordi* on any Hispaniolan satellite is noteworthy, and it will be most interesting to determine the status of the Isla Saona population.

## METHODOLOGY

The series of 403 *A. ricordi* was divided into 14 samples on the basis of geography, as follows: *República Dominicana*: 1) Península de Samaná (54 specimens); 2) northeastern República Dominicana, from Duarte and eastern La Vega provinces east to the *haitises* region in northeastern San Cristóbal Province (37); 3) extreme eastern Hispaniola, Punta Cana-Juanillo, Boca de Yuma, La Altagracia Province (16); 4) southeastern República Dominicana from Higüey and Las Lisas, La Altagracia Province, west to Santo Domingo and Yamasá, San Cristóbal Province (61); 5) lowlands at the northern base of the Cordillera Central at Guaiguí, La Vega Province (21); 6) Cordillera Central at and above elevations of 2000 feet (18); 7) Cordillera Septentrional and north (15); 8) Sierra Martín García and Peravia and Azua provinces (6); 9) Sierra de Baoruco and associated east coast of the Península de Barahona (33); 10) Oviedo, Pedernales Province (1); *Haiti*: 11) Saltrou and vicinity, Dépt. de l'Ouest (15); 12) region about Port-au-Prince, Mirebalais, northern Haitian littoral, Chaîne de Marmelade, and (in the República Dominicana) region about Pepillo Salcedo, Copey, Los Quemados, Restauración, and the southern slopes of the Cordillera Central and the Sierra de Neiba (50); 13) Camp Perrin and Marceline, Dépt. du Sud (54); and 14) vicinity of Castillon, Dépt. du Sud (6). This division into 14 regional

samples was completed after preliminary examination of the material, scale counts and detailed review of field notes on coloration and pattern were all made. In addition, two other small lots (eight specimens from the vicinity of Miragoâne, Dépt. du Sud, Haiti, and seven specimens from El Seibo Province, República Dominicana) were examined separately; in both cases, these short series indicate intergradient tendencies between pairs of the 14 major samples noted above, and they were not included with the latter.

The following data were taken on each specimen:

- 1) Snout-vent length, in millimeters.
- 2) Number of snout scales across snout at level of the second canthal scale, reckoned from the anterior corner of the orbit.
- 3) Number of vertical rows of loreal scales.
- 4) Minimum number of scales between supraorbital semicircles.
- 5) Number of scales between the interparietal scale and the supraorbital semicircles on each side, this datum written as a fraction (*i.e.*, 5/5 = five scales in this position on each side).
- 6) Number of scale rows between the subocular scales and the supralabial scales.
- 7) Number of vertical rows of dorsal scales in a distance equal to that from the tip of the snout to the anterior bony wall of the orbit, this distance measured by vernier calipers, laid off on the back about three rows below the median dorsal crest scales, and the number of scales counted under a binocular dissecting microscope.
- 8) Number of horizontal rows of dorsal scales in the snout-eye distance, the scales counted at midbody. This count was not taken in most juveniles or on those specimens that were shrunken or poorly preserved since, under the latter circumstances, some smaller ventrolateral or ventral scales will be included.
- 9) Number of transverse rows of ventral scales in the snout-eye distance.

10) Number of lamellae on phalanges II and III of the fourth toe.

11) Height of the nuchal crest scales, categorized as very high, high, moderate, or low.

12) Height of dorsal crest scales, categorized as high, moderate, or low.

13) Dorsal coloration and pattern of males and females, separately.

14) Ventral coloration of males and females, separately.

15) Color of dewlap, in males and females, separately.

16) Color and pattern of chin and throat in males and females, separately.

17) Color and pattern of upper surface of head in males and females, separately.

18) Color of eyeskin.

19) Color and pattern of upper surfaces of hindlimbs.

20) Color and pattern of juveniles and subadults.

The above characteristics are variously useful as far as delimiting the noteworthy populations of *A. ricordi*. Detailed comments on these characteristics are made below, with especial attention to pitfalls in their reliability and usage.

1) The snout-vent length of mature individuals of both sexes is remarkably uniform throughout the entire series. Males are easily distinguished from females at any age by the presence of one (occasionally two) pairs of enlarged postanal scales. Many ASFS specimens have the hemipenes extruded. Males in general reach a larger snout-vent length than females; the largest male (ASFS V29284) has a snout-vent length of 180 and is from sample (4), whereas the largest female (ASFS V31397) has a snout-vent length of 151 and is from sample (12). The mean difference in snout-vent lengths between the two sexes is about 10 mm in almost all samples with the exception of maximally sized individuals in both sexes in sample (2) where the difference is 3 mm, sample (3) where the difference is 27 mm, sample (4) where the



difference is 32 mm, and sample (7) where both sexes are of the same size. Whether these exceptions to the 10-mm generalization are meaningful is debatable. At least samples (2) and (4) include long series of specimens, and even samples (3) and (7) include more than ten individuals. Adults of the two sexes are readily distinguished morphologically, since males have a high tail "fin" that is supported by the bony extensions of the neural spines; this feature is lacking in females, although they may have a much reduced caudal crest in the form of a low ridge. The terminal half of the tails of many males is crestless; I at first considered that this was due to breakage with subsequent regeneration without regeneration of the tail "fin." Many specimens have this condition, however, without any obvious change in basic caudal scale shape and arrangement, and this is the normal condition in the tails of males. Often the uncrested portion of the tail is quite differently colored or patterned than the remainder of the tail; such cases are due to regeneration.

2) The number of snout scales at the level of the second canthal has been employed as a characteristic to separate the recognized subspecies. Williams (1962, 1965) recorded the following variation in the four subspecies: *ricordi*, 7-9; *baleatus*, 2-5; *barahonae*, 4-6; and *leberi*, 4-6 (3-6 on map, fig. 2, 1965: 7). It should be recalled that Williams himself pointed out that this count *alone* would not distinguish all these taxa from each other. Certainly overlap between *baleatus* and *ricordi* is nonexistent, and between *baleatus* on one hand, and *barahonae* or *leberi* on the other hand, the overlap is small. Counts on 403 specimens made by myself do not extend the parameters of snout scales at all: within the entire lot of specimens, these scales vary from 2 to 9, just as in Williams's data. However, the variation within populations may be much greater than Williams anticipated. For instance, in sample (13), the counts vary between 2 and 7, and in series

(12) between 4 and 8. Most samples have three or four categories of number of snout scales. I am in no way implying that this is an invalid or poor character for differentiation of populations of *A. ricordi*, however; it is, rather, an extremely useful one but requires amplification and interpretation.

If we examine only those samples (1-8) which are assigned to *baleatus*, the amount of variation in snout-scales is 2-5, exactly that assigned to this taxon by Williams. However, within the broad area covered by *baleatus*, there are strong modalities of snout-scales. In samples (1), (4), (5), and (6), the mode is 2 scales, whereas in samples (2), (7) and (8), the mode is 4. Only one sample, (3), has bimodes of 2 and 4 scales. In *barahonae* (9) the range is 2-5 (mode 4). In those samples which are associated with nominate *ricordi* (samples 11 and 12), *leberi* (sample 13) and adjacent Castillon material (sample 14), the range is 2-9, thereby showing complete overlap in range of this count with that of both *baleatus* and *barahonae*. In fact, in *leberi* (13) alone, the range of snout scales (2-7) almost embraces that for all other samples and thus the entire species. Modalities in this complex of samples are 5 (sample 11), 7 (sample 12), 4 (sample 13) and 6 (sample 14). Sample (7) is nominate *ricordi*.

3) The number of vertical rows of loreal scales ranges from 5 to 10. The greatest variability is in samples (1), (2), (7), and (12), where the row counts in each case are 5-9, 6-10, 5-9, and 6-10. Most samples have four categories of number of loreal rows. The modes vary as follows: 5 (sample 11), 6 (samples 8, 9, 13), 7 (samples 1, 3, 4, 5, 6, 7, 12, and 14), and 8 (sample 2).

4) The minimal number of scales between the supraorbital semicircles varies between 1 and 5; no specimen has the semicircles in contact. Modes in general are very strong, and the usual mode is 3 scales (samples 1-7; sample 8 has a bimode of 2 and 3 scales); these are all samples that

are assigned to *baleatus*. A mode of 3 scales occurs also in samples (11) and (13), and of 4 in samples (12) and (14).

5) The number of scales between the interparietal scale and the supraorbital semicircles varies between 3/3 and 7/7. Modes (which in some cases are quite strong and in others less so) are: 4/4 (samples 1, 5, 6, 8, 9, 11, 13, 14) and 5/5 (samples 2, 4, 7, 12). Sample (3) is peculiar in having the mode 4/5 (six of 16 lizards), with adjacent counts of 4/4 (four lizards) and 5/5 (five lizards). There is high variability in this count; it can be assessed in another fashion, namely, the frequency with which any scale count (*i.e.*, 4, 5, 6, etc.) occurs within the sample, regardless of its pairing with another count on the other side of the head. With the use of this technique, the frequency of involvement of 4 scales in the interparietal-semicircle contact varies between 43 percent (sample 1) and 67 percent (sample 8), and of 5 scales between 52 percent (sample 2) and 64 percent (sample 7). Of the entire lot of specimens, there is only one occurrence of 7/7 in this position (sample 12) but many occurrences of 3/3 (samples 1, 5, 6, 9, 11, 12, 13, a total of 12 incidences).

6) The number of scale rows between the subocular scales and the supralabials is fairly constantly 1, and this is a strong mode or the exclusive category in all samples except sample (13). In this lot (which is the type series, with a few new specimens, of *leberi*), 48 percent of the lizards have the suboculars and supralabials in contact. Elsewhere, contact is absent in samples (7) and (11). The frequency of contact varies in all other samples between 3 percent (sample 9) and 17 percent (samples 6, 8, and 14). These three samples are widely separated geographically and the frequency in none of them even approaches the very high incidence of contact in sample (13). However, it is noteworthy that samples (13) and (14) are adjacent geographically.

7), 8), 9) In reference to all counts involving laying out the snout-orbit distance

on the body, I can do no better than once more to reiterate the cautions previously expressed (Schwartz, 1964; Garrido and Schwartz, 1968; Schwartz and Garrido, 1972) in reference to *Anolis equestris* and members of the genus *Chamaeleolis*. For these standard-distance counts, old and poorly preserved, limp, curled, uninjected, or otherwise distorted specimens are much less useful and reliable than properly preserved, injected, and positioned lizards. Luckily, by far the largest quantity of *A. ricordi* under study are well preserved. However, I have abandoned counts of horizontal dorsals on young juveniles, even well-preserved ones, or on any adults whose condition precluded taking these counts meaningfully. The juvenile situation is peculiar in that invariably, despite the relatively shorter snout of young specimens, laying out this distance to count horizontal rows involved including several rows of extremely lateral and ventral scales, which are smaller than true dorsals and which thus tend to increase the horizontal counts. I have taken vertical dorsals and ventrals on juveniles, however, and they do not skew the data. Of the three standard-distance counts, those of vertical dorsals and ventrals are much more reliable than are those of horizontal dorsals.

Vertical dorsal scale rows vary between 12 and 26, with the low count in sample (4) and the high count in sample (12). Means range from 15.4 (sample 4) to 21.1 (sample 12). These two represent, respectively, lots assignable to *baleatus* and *ricordi*, *sensu lato*. No generalizations of mean number of vertical dorsals in reference to samples and geography can be made, since the range in samples now associated with *baleatus* varies between 15.4 and 19.2, with *ricordi* 17.3 and 21.1, *barahonae* 17.2, and *leberi* 16.5 and 16.7. Comparisons and significance of vertical dorsal scale counts are shown in Table I.

Number of horizontal dorsal rows ranges from 13 (sample 1) to 34 (sample 7). Means vary between 17.1 (sample 11) to 24.6 (sample 12). The latter sample is that

TABLE I. COMPARISON OF NUMBER OF VERTICAL DORSAL SCALES IN POPULATIONS OF GIANT HISPANIOLAN ANOLES

Taxon	N	M ( $\pm 2$ standard error of mean)	<i>leberi</i>	<i>subsolanus</i>	<i>barahonae</i>	<i>samanae</i>	<i>caeruleolatus</i>	<i>litorisilva</i>	<i>scelestus</i>	<i>multistruppus</i>	<i>sublimis</i>	<i>baleatus</i>
<i>ricordi</i>	50	21.1 $\pm$ .57	+	+	+	+	+	+	+	+	+	+
<i>leberi</i>	54	16.5 $\pm$ .46		-	-	-	-	-	+	+	+	-
<i>subsolanus</i>	15	17.3 $\pm$ .96			-	-	-	-	+	-	+	-
<i>barahonae</i>	33	17.2 $\pm$ .67				-	-	-	+	-	+	-
<i>samanae</i>	54	16.6 $\pm$ .46					-	-	+	+	+	-
<i>caeruleolatus</i>	37	17.1 $\pm$ .72						-	+	+	+	-
<i>litorisilva</i>	16	15.9 $\pm$ .75							-	+	+	+
<i>scelestus</i>	60	15.4 $\pm$ .45								+	+	+
<i>multistruppus</i>	20	18.6 $\pm$ 1.06									-	-
<i>sublimis</i>	18	19.2 $\pm$ .70										-
<i>baleatus</i>	15	17.5 $\pm$ 1.16										-

*A. r. viculus*, *A. b. albocellatus*, and *A. b. fraudator* are not included. A "+" in the table indicates that the two subspecies involved differ significantly (non-overlap of two standard errors of mean); a "-" indicates no statistical difference. Note that the mean of *A. r. ricordi* differs significantly from the means of all other taxa; that of *scelestus* differs significantly from those of all other taxa except *litorisilva*; and that of *sublimis* differs significantly from those of all other taxa except *multistruppus* and *baleatus*.

of nominate *ricordi*, the former a peripheral isolate of *baleatus*.

Number of transverse rows of ventral scales varies between 15 (samples 1 and 13) and 34 (sample 7). Means range from 20.2 (sample 13) to 25.1 (sample 6); sample (13) is *leberi*.

10) The number of lamellae on phalanges II and III of the fourth toe varies between 27 and 39. The variation in any population is so great that this count is meaningless as far as differentiation between any populations of *A. ricordi*.

11), 12) Williams (1962, 1965) described the relative heights and lengths of both the nuchal and dorsal body crest scales. Certainly the differences between *baleatus* and *ricordi*, for instance, are so very obvious on casual examination that one has no difficulty in ascertaining the taxon involved. Williams also pointed out (1962: 4-5) that in some specimens there is "sometimes a regular alternation of relatively high triangular single scales and pairs of much lower, more quadrangular scales," with the result, on some specimens, of double crest scale rows on the neck; the net effect of this condition is a rather indiscriminate grouping or elongate patch of

multiple nuchal crest scales. Although this condition occurs erratically, it seems to be most predominant in specimens from the Tiburon Peninsula, but it occurs elsewhere in nominate *ricordi* and even occasionally in specimens assigned now to *baleatus*. Such a "hypertrophied" nuchal crest condition does not completely fit any logical geographical pattern nor is it totally consistent within any sample, although there are tendencies toward it as noted above. In any event, it does not obscure the height of the nuchal crest scales.

In my own analysis, I have used a slightly different method in recording height of crest scales. Nuchal scales were recorded for each specimen as very high, high, moderate, or low. Such a verbal quantification is not totally satisfactory, since the investigator's impressions may change as the study progresses. To avoid this pitfall, I re-examined many specimens that had been studied earlier in the work and reconfirmed my own early impressions with my later ones. Body crest scales were recorded as high, moderate, and low.

In nuchal crest scales, very high scales are those which are very elongate, attenuate, almost spinelike (but of course flexible,

not stiff), with the base much shorter than the height of the scale. High scales are those which are shorter and less attenuate than very high scales, but whose height is still much greater than the base. Moderate scales are lower and not attenuate, although they may be pointed, with the height and base about equal in length. Low scales are lower than long. The same categories and interpretations apply to body crest scales, although no lizard has the body crest scales so high as the nuchal scales.

Several other points are pertinent. I have not used this datum from juvenile and subadult lizards (all lizards below 100 mm snout-vent length) since it is obvious that, regardless of the taxon or sample, all young *A. ricordi* have low nuchal and dorsal crest scales, which, as the lizard matures, become increasingly more specialized until the adult condition is reached at about 110 mm snout-vent length. Thus young *ricordi* and young *baleatus*, two taxa that are remarkably distinct in this feature as adults, are identical in crest development.

Secondly, it might be assumed that (especially) nuchal crest scales might be better developed in adult males than in adult females; this excessive development might reasonably be assumed or construed as a sexually dimorphic character, with hyperdevelopment in males. Such does not seem to be the case, and many female *baleatus*, for instance, have very high nuchal crest scales, as high as those of males. In fact, comparisons of males and females of individual samples show that, within each sample, there is remarkable consistency between frequencies of the very high, high, and moderate categories in both sexes.

Thirdly, as one might expect, there is a sequence of crest scale heights in the nuchal-body series. If the nuchal scales are very high, the body scales are high; if the nuchal scales are moderate, the body scales are low, etc. In no case have I recorded a transition from very high nuchal crest scales to moderate body scales, for example. There is thus a definite correlation between height of nuchal scales and those of the body crest.

13)–19) The color and pattern details of *Anolis ricordi* throughout its range need not be gone into in detail at this point. It is now sufficient to acknowledge that these lizards show metachrosis varying from shades of green and green-gray to brown. The pattern elements, however, are quite stable, although the hues involved in the pattern itself may change with changing base colors. There is little evidence to indicate that a lizard which is, for instance, blotched in one color phase will become crossbanded in another. Thus, despite changes in hues and even in base colors, patterns remain constant. It is of interest to note that greens seem to be the colors that predominate in the wild. The few *A. ricordi* that I have seen during the day have always been green. The many lizards that I have seen and collected at night were almost always green, and usually at their maximum of pattern expression while they slept. It is this nocturnal assumption of the green phase coloration that renders these lizards so very conspicuous at night while they sleep on exposed branches, vines, or among the arboreal greenery. Even in those populations (Boca de Yuma, Sierra de Baoruco) in which the greens involved are not bright, the lizards are still quite obvious at night. It is only rarely that one encounters a brown *A. ricordi* at night. I have notes on only one instance of this condition, a subadult lizard from the Cordillera Septentrional.

15) The dewlap coloration in *A. ricordi* is variable. In some populations, males have a pale yellow to gray dewlap, whereas in others the males have dewlaps that are peach or vivid orange. It should be noted that both sexes in *A. ricordi* have dewlaps and that the general hue of the female dewlap is like that of the males, except that basally it is usually streaked with browns, dark grays, or charcoal, and the ground color is less bright than that of males. In some regions, the female dewlap is quite differently colored than that of males.

20) Juveniles and subadults present several problems that are presently insoluble. I suspect that much will be revealed once

we know the repertory of pattern and color in young individuals, but these data are not available now. Although there are many young specimens at hand, they are inconsistent within populations or even small samples. The juvenile color is normally some shade of green (or browns under stress), most often with two to four pale (cream, whitish, pale gray) crossbands. Many small specimens are a uniform green without any dorsal markings. In other juveniles, the dorsum has many conspicuous crossbands with two shades of greens (or browns), separated by prominent bands of pale greens (yellow-green, pea-green), to give a very tigroid lizard; this condition persists into the adults of one population, as does the more simply banded juvenile pattern noted above in other populations. The juveniles usually have dark gray to charcoal dewlaps, regardless of their sexes, and often there are charcoal or white markings on the neck or above the forelimb insertion or somewhere anteriorly. These variants are discussed under each subspecies below, and there is no need to go into the details here. However, I do wish to point out that juvenile patterns are more variable than are those of adults, and that I do not know how to interpret this situation.

## SYSTEMATIC ACCOUNTS

### *Anolis ricordi* Duméril and Bibron

*Anolis ricordi* Duméril and Bibron, 1837. *Erp. gén.*, 4: 167.

*Type locality.* St.-Domingue; holotype, Muséum National d'Histoire Naturelle 1272.

*Definition.* A giant species of Hispaniolan *Anolis* characterized by the combination of moderate size (males to 160 mm, females to 151 mm snout-vent length), snout scales at level of second canthal scales variable, between 2 and 9 (modally 4, 5, 6, or 7 by population) but usually 4 to 9 (97 percent), vertical loreal rows 5 to 10 (modes by population 5, 6, and 7), scales between supraorbital semicircles 2 to 5 (modes 3 or 4 by population), interparietal scale separated from supraorbital semicircles modally by 4 or 5 scales, vertical

dorsal scales generally small (14 to 26 in standard-distance), ventral scales relatively large (15 to 32 in standard-distance), nuchal crest scales in both sexes moderate to low, never very high or high, body crest scales usually low, subocular scales usually not in contact with supralabials but one population is remarkably exceptional in this character; dorsal body coloration and pattern some shade of green, in some geographic regions flecked irregularly with paler and darker green to give a beadwork effect; male body pattern either of irregular black to dark brown blotches on the neck, occipital region of the head, and on sides (often delimiting two pale longitudinal bands) or with three longitudinal dark brown stripes on each side or with dark saddles and a bluish green flank stripe or with a powdery pale blue-green lateral stripe; females usually without dark dorsal or lateral markings although in some areas females have a darker brown reticulum, three pale gray to yellow narrow crossbands, longitudinal black lines, or two purple flank stripes; dewlap in males variable, from yellowish gray to peach, bright orange, or deep yellow, in females from peach to deep yellow or dull orange or even inky brown or inky blue-black, chin and throat dull yellow, yellow-green, or pale blue-green in males, eyeskin dark (charcoal, dark brown) to light (pale blue) in males, charcoal to pale green in females, and usually with a prominent pale subocular semicircle clearly delineated.

*Distribution.* The Tiburon Peninsula in Haiti, east to the vicinity of Saltrou, Dépt. de l'Ouest, thence north to the northern Haitian coast from Port-de-Paix east to Terrier Rouge and thence into the Republica Dominicana east as far as the vicinity of Los Quemados, Santiago Rodríguez Province, south to Restauración, Dajabón Province; also extending from Haiti onto the southwestern slopes of the Cordillera Central in San Juan Province and in the Sierra de Neiba in La Estrelleta and San Juan provinces; altitudinal distribution from sea level to elevations of about 4000 feet (1220 meters) south of Castillon, Dépt. du Sud,

Haiti, and to 3500 feet (1068 meters) west of Marmelade in the Chaîne de Marmelade, Dépt. de l'Artibonite, and 3400 feet (1037 meters) south of Elías Piña in the Sierra de Neiba, La Estrelleta Province, República Dominicana.

***Anolis ricordi ricordi* Duméril and Bibron**

*Type locality.* "St.-Domingue"; here restricted to the vicinity of Port-au-Prince, Dépt. de l'Ouest, Haiti.

*Definition.* A subspecies of *A. ricordi* characterized by the combination of modally 7 snout scales between second canthal scales, 7 vertical rows of loreal scales, 4 scales between the supraorbital semicircles, 5/5 scales between the interparietal and the supraorbital semicircles, high number of vertical dorsal scales (17–26; mean 21.1), high number of ventral scales (19–32; mean 24.7), nuchal crest scales moderate (rarely) to low (usually), body crest scales moderate (rarely) to low (usually), subocular scales usually in contact with supralabial scales; males usually with some black lateral markings on the neck and thoracic region, and on the occipital region of the head, but at times these markings are absent (see discussion below), females green and without definite black lateral markings but at times reticulate with brown, the reticulum delimiting a pair of clear green lateral stripes or with three pale gray to green vertical narrow bars; dewlap variable, in males from peach or pale peach to gray or yellowish gray, and in females from peach to blue-gray or inky blue or inky black (see discussion beyond).

*Distribution.* Northern Haiti from Port-de-Paix east to Terrier Rouge and into the República Dominicana as far east as the vicinity of Los Quemados, Santiago Rodríguez Province, and as far south as Restauración, Dajabón Province, south in Haiti to the Port-au-Prince region (Morne Decayette, Diquini, Pétienville), as well as east into the República Dominicana in the Sierra de Neiba and the southwestern slopes of the Cordillera Central in La Estrelleta and San Juan provinces.

*Discussion.* I have little doubt that the extensive range that I here ascribe to nominate *A. ricordi* is incorrect. There are several very obvious differences in coloration and pattern between northern and southern specimens of *A. r. ricordi*; thus the definition of the subspecies, in order to include all pattern variants, is necessarily cumbersome. The problem is presently unresolvable since, other than the series from near Port-au-Prince and the specimens from northern Haiti, there are huge areas in Haiti whence specimens remain unknown. A detailed discussion of the chromatic and pattern features in the various segments of *A. r. ricordi* is given below.

The series of 50 specimens assigned to the nominate subspecies shows the following variation. The largest male (ASFS V31395) has a snout-vent length of 160, the largest female (ASFS V31397) 151; both are from 4.1 mi. NW Juan de Herrera, San Juan Province, República Dominicana. Snout scales at level of second canthals vary between 4 and 8; the mode is 7 (22 specimens). The vertical loreal rows vary between 6 and 10, with a mode of 7 (20 specimens). There are between 3 and 5 scales between the supraorbital semicircles (mode 4). There are modally 5 scales between the interparietal and the semicircles; 5 scales are involved in 53 percent of the combinations; actual counts are 3/3 (1), 4/4 (10), 4/5 (8), 5/5 (17), 5/6 (9), 6/6 (2), 7/7 (1), and 5/7 (1). Vertical dorsals range between 17 and 26 (mean 21.1), horizontal dorsals between 19 and 30 (24.6), and ventrals between 19 and 32 (24.7). Of 28 adult males, six have moderate nuchal crest scales and 22 have these scales low; of 11 females, all have the nuchal crest scales low. Body crest scales are moderate in two males and low in 26, and 11 females have the body crest scales low. The suboculars are separated from the supralabials in 45 of 49 instances, and contact between these scales occurs in four lizards (8 percent).

The southern specimens from the Port-au-Prince region and including two from

Mirebalais, consist of ten adult males, three adult females, and two juvenile females (MCZ 60013-14). The latter two specimens (with snout-vent lengths of 89 and 92 mm) can be easily dismissed in that they are presently patternless green. Color notes in life on one southern male (ASFS V9024) state that in the green phase, the lizard had the dorsum a mixture of pale green, brown, and yellow, with green the predominant color, the net effect being one of beadwork. The upper surface of the head was a mixture of pinkish and yellow scales, the mental region and adjacent upper labials were dull yellow, and the venter pale green. The dewlap was peach with the dewlap scales yellow. All males (with the exception of MCZ 69404, which is an albino) have some black to dark brown occipital blotching, usually extending onto the neck and thence onto the area above the forelimb insertion. The extent of the dark anterior markings is variable, but they are present in all males and quite vivid in freshly taken specimens. A pale subocular crescent is present, often extending posteriorly to form a pale preauricular blotch, bounded above by a large dark temporal blotch that may form an occipital chevron by joining its mate on the other side. Southern females were recorded in life as pale to bright green without any dark pattern, with a moderately well-defined pale subocular crescent that may expand into a pale preauricular blotch; the venters were yellow-green. In one female, the dewlap was reported as blue-gray with yellow-green streaks. The hindlimbs are not prominently banded. Neither sex has the throat marked with any blotching or dotting, although the females have the throat somewhat clouded with dull dark green.

The series for the Sierra de Neiba and the Cordillera Central consists of six males, four females, and eight juveniles and subadults. The males were described in life as being dark green with pale green crossbands, or pale green with four paler green crossbands, or patternless green. The upper surface of the head was creamy tan.

Black blotches occur in this series of males also, but the occiput lacks clearly defined black areas, and the black on the body is much more extensive than it is in all southern males, the extreme condition being that shown by ASFS V31395, which has extensive black blotching over two-thirds of the back and sides. The pale subocular crescent is very obscure, but there is a prominent pale preauricular spot in most males. The females from this region are plain green, without dark markings, and there is a prominent pale supralabial blotch in the area which in males is occupied by the pale preauricular blotch. Dewlaps in males and females were invariably recorded as peach, and both sexes had charcoal eyeskins. As in southern specimens, the chins and throats are pale green and without any definite markings, except that the throats of females are suffused with darker green. The eight juveniles and subadults range in snout-vent length from 68 mm to 92 mm. The two smallest specimens, a male and a female, were rich pea-green in life with four, narrow, cream transverse crossbars, and the smaller had in addition black streaking in the green areas and a black postauricular smudge. The ventral color was rich pea-green and the dewlap skin was blue-black. All juveniles and subadults with snout-vent lengths of between 76 and 92 were bright emerald-green dorsally and without any dorsal dark or pale markings; one female juvenile (snout-vent length 78) had a lateral black nuchal spot followed by a bright yellow preaxillary bar, as well as a bright yellow subocular mark. The dewlap was recorded as black in a juvenile female with a snout-vent length of 89. Of the subadults, the most peculiar is a male (ASFS V31323) with a snout-vent length of 90 which shows, as preserved, a vague series of vertical lateral pale and dark areas, but as yet no black blotching typical of adult males.

The northern specimens are six males and one female from Haiti, five males and two females from the República Dominicana, and one Haitian subadult and two Domin-

ican subadult and juvenile lizards. Haitian males are not only quite different from northern Dominican males, but they are also strikingly different from central and southern males. In the Haitian males, the dorsum is gray-green with yellow-green flecking, or a beadwork mixture of dark and light green scales. The upper surface of the head is dark with light flecking, and in one male the head was recorded as dark brown with the centers of the scales pale purple. No male has any occipital dark blotching, and any body blotching, if it is at all present, is extremely restricted and maximally expressed as small black areas above the forelimb insertion (MCZ 66147). The pale subocular crescent is obscure, but there is a pale postlabial line leading to the auricular opening. Northern Dominican males, on the other hand, are brightly colored and have extensive black neck and side markings; in two males these latter extend far posteriorly on the body and tend to delimit two lateral stripes on each side. The upper surfaces of the head are not mottled but are pale uniform tan. In life, the pale subocular crescent is bold and pale blue to white, and it may extend to the auricular opening. In Haitian males, the dewlap is grayish to yellowish peach (pl. 12C5; all color designations from Maerz and Paul, 1950), pale gray-green (about pl. 19B2), or yellowish gray (about pl. 20B1). In northern Dominican males, the dewlap is pale peach to pale yellow or grayish yellow, and the dewlap may be speckled with brown basally.

The single Haitian female is presently unmarked green, with faint scattered cream flecking. The larger of the two Dominican females was pale green above with a darker brown reticulum outlining a pair of green lateral stripes on each side. There was a postauricular brown smudge, followed by a pale blue axillary smudge. The temples were yellow-green, the lores pale blue and brown, the eyeskin pale green, and there was a pale blue subocular crescent that extended into a preauricular pale blotch. The top of the head was marbled pale tan and

dark brown, and the venter was the same color as the dorsum. The other Dominican female was green without any dorsal markings.

The Haitian subadult (MCZ 66148) is a female with a snout-vent length of 106. It is speckled with pale scales on a dark ground like Haitian males. The smaller of the two Dominican males (ASFS V18008) has a snout-vent length of 75 and was bright yellow-green above with two cream crossbands and a yellow subocular crescent. The second Dominican male (ASFS V32160) has a snout-vent length of 103 mm, and, like Dominican adult males, has extensive black blotching on the head, neck, and almost the entire dorsum. The ground color was pale green, and the dewlap was dark brown.

To summarize all the above data, it is obvious that I have included several populations in *A. r. ricordi* which differ rather strikingly among themselves. Southern Haitian males are marked with black on the occiput, neck, and anterior sides, and central Dominican and northern Dominican specimens increase this tendency to show even more extensive black lateral markings. On the other hand, northern Haitian males as a group show very little or no black markings and are basically green-flecked green lizards. Northern Dominican males are much more colorful than specimens from elsewhere, and much more contrastingly marked. On the other hand, all females are fairly similar, with the exception of the remarkably colored and patterned female from the northern República Dominicana. I suspect that it will ultimately be shown that there are at least two more noteworthy populations included in *A. r. ricordi* as here defined by me: a northern Haitian subspecies, a northern and central Dominican population, as well as the southern Haitian one. But the specimens at this time are from such disjunct localities and are so limited in number that I am unwilling to make the suggested nomenclatural additions.

*Remarks.* *A. r. ricordi* occurs in a wide



variety of situations but is of course always associated with trees. Its altitudinal range is from sea level at many localities to elevations of 3500 feet (1068 meters) in the Chaîne de Marmelade in northern Haiti and 3400 feet (1037 meters) in the Sierra de Neiba. Almost all specimens taken by myself and parties were secured sleeping at night. Williams (1965: 2-3) noted that in the Monte Cristi region these lizards sleep in viny tangles, especially where there are dense "mats" or "curtains" of vines under a canopy. Such a situation is ideal in the xeric forests in the Monte Cristi area. At Las Matas de Farfán, the lizards were easily secured at night in a high-canopied *cafetal*, sleeping on limbs, branches, or on vines, either vertical or horizontal. A specimen from Morne Calvaire near Pétienville was seen during the late morning on a mango tree in an open pasture, about 4 feet (1.2 meters) above the base. Thomas commented in his field notes upon a specimen from Le Borgne which was observed 8 feet (2.4 meters) above the ground on the trunk of a tree; this male led the pursuers a merry chase through a series of three trees and finally sought refuge in dense grass on the ground, where it was caught! The male from Terrier Rouge was collected with a slingshot while it rested head-down on the main branch of a large tree 15 feet (4.6 meters) above the ground. South of Las Matas de Farfán I secured a juvenile sleeping on a horizontal vine in a tree-fern thicket adjacent to a mountain brook. The association of *A. r. ricordi* with rivers or lakes is certainly fortuitous; the greatest concentrations of these lizards occur in such obviously mesic situations only because there is often gallery forest restricted, or limited by man, to streambanks. However, such a situation is not a guarantee of securing specimens. In our effort to narrow the previously existing gap between *ricordi* and *baleatus* in the northwestern República Dominicana, we questioned natives concerning the occurrence of *saltacocotes* in the region along the gallery-forested Río Yaque del Norte, which here passes

through cactus desert. We were assured that the lizards indeed occurred there, and we were fortunate in finding a superb area of gallery forest in the steep-sided valley of the Río Guarabo, west of Los Quemados. The Guarabo is a southern affluent of the Yaque, and we had no doubt that these splendid hardwoods harbored *A. ricordi*. But it was not until our fifth nocturnal visit that a single subadult was secured, despite the attentions of four collectors. The woods here present a perfect aspect for *A. ricordi*—dense and large trees connected and interlaced with vines and lianas, all quite rich and mesic; still, our experience indicates that, at least at the time of our visit, *A. ricordi* was distinctly uncommon or difficult to see in what elsewhere surely would have been a typically simple area for collection of these lizards. In this instance, demands for at least one specimen from this region forced persistence which ultimately yielded the requisite animal. Such may well be the case in many otherwise xeric regions, where *A. ricordi* is restricted to (and perhaps is rare in) more mesic riverine hardwood stands.

*Specimens examined.* HAITI: *Dépt. de l'Ouest*, Source Leclerc, Morne Decayette (MCZ 65729-31); Diquini (MCZ 8619, USNM 118902, USNM 123347, USNM 123988); Port-au-Prince (AMNH 49501); Pétienville (MCZ 60013-14); Morne Calvaire, 1 mi. (1.6 km) SW Pétienville, 2300 feet (702 meters) (ASFS X1711, ASFS V8514, ASFS V9024); Mirebalais (MCZ 69404); Lancironelle, nr. Mirebalais (not mapped) (MCZ 68479); *Dépt. de l'Artibonite*, 8-9 km W Marmelade, 3500 feet (1068 meters) (ASFS V9925); *Dépt. du Nord Ouest*, Port-de-Paix (MCZ 63338); *Dépt. du Nord*, 3 mi. (4.8 km) SW Le Borgne (ASFS V10005); 2 mi. (3.2 km) SW Cap-Haïtien (ASFS V10766); Ti Guinin, nr. Cap-Haïtien (not mapped) (MCZ 66147-49); 8 mi. (12.8 km) E Terrier Rouge (ASFS V10169). REPÚBLICA DOMINICANA: *Monte Cristi Province*, 1 km W Copey (ASFS V1269, ASFS V1411-12, ASFS V1470); Laguna de Salodillo, 7

km E Pepillo Salcedo (ASFS V1413); *Dajabón Province*, Restauración (ASFS V18006-08); *Santiago Rodríguez Province*, 1.8 mi. (2.9 km) W Los Quemados, 500 feet (153 meters) (ASFS V32160); *La Estrelleta Province*, 6.7 mi. (10.7 km) E Hondo Valle, 2500 feet (763 meters) (ASFS V31428); 11.0 mi. (17.6 km) S Elías Piña, 3400 feet (1037 meters) (ASFS V31509); *San Juan Province*, 4.9 mi. (7.8 km) NW Vallejuelo, 2400 feet (732 meters) (ASFS V31305); 6.1 mi. (9.8 km) S Las Matas de Farfán, 1800 feet (549 meters) (ASFS V14562, ASFS V31469, ASFS V31319-26); 4.1 mi. (6.6 km) NW Juan de Herrera, 1600 feet (488 meters) (ASFS V31395-99).

### *Anolis ricordi leberi* Williams

*Anolis ricordi leberi* Williams, 1965. *Breviora*, Mus. Comp. Zool., No. 232: 4.

*Type locality.* Camp Perrin, Département du Sud, Haiti; holotype, MCZ 80935.

*Definition.* A subspecies of *A. ricordi* characterized by the combination of modally 4 snout scales between second canthals, 6 vertical rows of loreal scales, 3 scales between the supraorbital semicircles, 4/4 scales between the interparietal and the supraorbital semicircles, low number of vertical dorsal scales (14-21; mean 16.5), low number of ventral scales (15-28; mean 20.2), nuchal crest scales usually moderate, rarely low in males, usually low, occasionally moderate in females, subocular scales in contact with supralabials in almost 50 percent of the specimens; males either pale yellow-green with four dark saddles and a bluish green flank stripe, or with about three longitudinal dark brown lateral stripes, or simply dark brown, females bright green (much brighter than males), with longitudinal black lines indicated and at times a greenish tan middorsal wash; dewlap bright orange or orange with an anterior brown wash in males, and dull orange, at times suffused or marbled with brown, in females.

*Distribution.* Known only from the vicinity of the type locality and Marceline,

on the southern slopes of the Massif de la Hotte, between elevations of 1000 and 1220 feet (305 and 372 meters), Dépt. du Sud, Haiti.

*Discussion.* In contrast to the situation in *A. r. ricordi*, *A. r. leberi* is known from a long series of specimens all from the same general area, at elevations between 1000 feet and 1220 feet (305 and 372 meters). Williams (1965: 6) assigned a single juvenile (MCZ 38277) from Tardieu, near Pic Macaya, Dépt. du Sud, Haiti, to *leberi* with some reservation. This locality is northwest of Camp Perrin-Marceline, is on the northern slopes of the Massif de la Hotte, and is much closer to the known distribution of the next subspecies to be described below.

The series of 54 *A. r. leberi* shows the following variation. The largest male (ASFS X3034) has a snout-vent length of 147, the largest female (AMNH 98723) 153; both are from Camp Perrin. Snout scales at level of the second canthal are extremely variable, and range between 2 and 7; the mode is 4 (23 specimens). The vertical loreal rows vary between 5 and 8, with a mode of 6 (26 specimens). There are between 1 and 4 scales between the supraorbital semicircles (mode 3). There are modally 4 scales between the interparietal and the semicircles; 4 scales are involved in 64 percent of the combinations; actual counts are 3/3 (3), 3/4 (7), 4/4 (25), 4/5 (10), 5/5 (2), 5/6 (2), 6/6 (1), 3/5 (1), and 5/7 (1). Vertical dorsals range between 14 and 21 (mean 16.5), horizontal dorsals between 15 and 24 (18.0), and ventrals between 15 and 28 (20.2). Of 39 adult males, 30 have the nuchal crest scales moderate and nine have them low; of 13 females, five have the nuchal scales moderate and eight have them low. Body crest scales are moderate in 12 males and low in 27 males, whereas only one female has the dorsal crest scales moderate and 12 have them low. The suboculars are separated from the supralabials by 1 row of scales in 28 specimens and are in contact with the supralabials in 26 specimens. *A. r. leberi* is the only population

that has such a high incidence (48 percent) of subocular-supralabial contact.

Males show three basic patterns: 1) dorsal ground color pale yellow-green with four dark brown saddles and a bluish green flank stripe that is complete; 2) about three longitudinal dark brown stripes, the central one being the most prominent and complete; 3) and a uniform dark velvety brown. In the two lighter phases, the eyeskin is pale blue, chin and throats are dull yellow-green, and the subocular crescent is pale blue and very conspicuous. The dewlaps in males are orange (brighter than any Maerz and Paul designation) or orange with an anterior brown wash. Females are bright green dorsally (much brighter than males) with longitudinal black lines indicated. There is a greenish tan wash on the upper surface of the head, and there may be a greenish tan middorsal zone on the body. The dewlap in females is dull orange, often suffused or marbled with brown, and the eyeskin is green, paler than that of the dorsum. In males, the venter is pale green and may be washed with brown even in the green phase, and in females the venter is pale yellow-green, paler than the bright green of the dorsum.

In general aspect, male *A. r. leberi* are lineate dorsally and laterally, the bold dark longitudinal lines usually interrupted by four irregular pale vertical crossbands, which are in turn bordered with darker pigment. Although my field notes indicate that there are about three longitudinal dark stripes in males, these three stripes are the result of modification of two stripes, of which the more dorsal is the broader. In many specimens, this upper flank stripe maintains its integrity, but in many others the upper stripe is hollowed centrally, resulting in three narrow dark stripes, rather than two stripes, of which the upper is very broad and the lower is narrow. Although females show some longitudinal striping, it is much less conspicuous than in males. Male throats are immaculate, whereas female throats are suffused with dark green.

There are three juveniles and subadults

from the type locality. The smallest (MCZ 83982) is a female with a snout-vent length of 52. The body is longitudinally streaked, but there are as yet no definite longitudinal lines. The subadults (MCZ 80949-50, a male with a snout-vent length of 105, and a female with a snout-vent length of 93) both show indications of the longitudinal stripes that are characteristic of adults, but the stripes are better defined in the subadult male than in the female. The two adult males and two adult females from Marceline agree in all pattern details with the topotypical series; Marceline and Camp Perrin are separated by about 4.5 kilometers airline.

*Comparisons.* Although both *A. r. ricordi* and *A. r. leberi* have several features in common, namely, the moderate to low nuchal and body crests, the presence of some sort of black body markings, and a prominent pale subocular crescent, these two subspecies are eminently distinct. They differ in: modal number of second canthal snout scales (*ricordi* 7, *leberi* 4), modal number of loreal rows (*ricordi* 7, *leberi* 6), modal number of scales between the interparietal and supraocular semicircles (*ricordi* 5/5, *leberi* 4/4), higher means of vertical dorsal scales and ventrals (21.1, 24.7 in *ricordi*, 16.5, 20.2 in *leberi*, respectively) and the very high incidence of contact between the subocular scales and the supralabials in *leberi* versus the rarity of this condition in *ricordi*. In addition, the dewlap in male *ricordi* is most often some shade of peach (although the variation in dewlap shades and colors in *ricordi* is readily acknowledged), whereas in male *leberi* the dewlap is orange or orange with a brown anterior wash. A ready hallmark between the two subspecies is the presence of a pale preauricular blotch in *ricordi*, a condition always absent in both sexes of *leberi*, with the result that instead of the pale subocular crescent's being incorporated into a postlabial line or preauricular blotch as it often is in *ricordi*, it is a bold and contrasting pattern element.

*Remarks.* All Camp Perrin specimens of

*A. r. leberi* were collected by natives and thus I have no precise knowledge of the habitat nor habits of this subspecies. Camp Perrin lies in the lower southern foothills of the high Massif de la Hotte, at about 1000 feet (305 meters), and the area in general is very mesic and presumably was once well forested, although now it supports *caféières* with a high-canopy hardwood shade cover. Williams (1962: 10) cited field notes by A. S. Rand and J. D. Lazell, Jr., on *A. r. leberi* at Camp Perrin and Marceline; both accounts involve trees associated with coffee plantings.

*Specimens examined.* HAITI: *Dépt. du Sud*, Camp Perrin (ASFS X3033-35, ASFS X3038-39, ASFS X3041-42, ASFS X3182, AMNH 93713-36, MCZ 80935-37, MCZ 80939-42, MCZ 80944-53, MCZ 83982); Marceline (MCZ 121115); Marceline area, ca. 1000 feet (305 meters) (MCZ 122269, MCZ 121779-80).

#### *Anolis ricordi viculus* new subspecies

*Holotype.* USNM 193974, an adult male, from Castillon, 2500 feet (763 meters), Département du Sud, Haiti, taken by native collector on 25-26 June 1971. Original number ASFS V25059.

*Paratypes.* ASFS V25058, same data as holotype; ASFS V25060, same locality and collector as holotype, 27 June 1971; ASFS V24801, ca. 2 km (airline) S Castillon, 3500-4000 feet (1068-1220 meters), *Dépt. du Sud*, Haiti, R. Thomas, 24 June 1971; ASFS V9335, ca. 5 km (airline) SE Marché Leon, 2200 feet (671 meters), *Dépt. du Sud*, Haiti, native collector, 15 March 1966; MCZ 119035, Castillon, *Dépt. du Sud*, Haiti, T. P. Webster, A. R. Kiester, and native collectors, 31 August 1969.

*Definition.* A subspecies of *A. ricordi* characterized by the combination of modally 6 snout scales between the second canthals, 7 vertical rows of loreal scales, 4 scales between the supraorbital semicircles, 4/4 scales between the interparietal and the supraorbital semicircles, low number of vertical dorsal scales (15-19; mean 16.7), moderate number of ventral scales (19-24;

mean 21.8), nuchal crest scales usually moderate but occasionally low in both sexes, dorsal body crest scales low in both sexes, subocular scales almost always separated by one row of scales from supralabial scales; males bright green dorsally with powdery pale blue-green lateral stripes, throat pale green and unmarked, venter pale green with pinkish and yellowish suffusions, females dark olive-green to bright green with two purple to powdery blue-gray flank stripes edged with dark brown, lower sides spotted bright green, yellow-green, or bright green with four bright yellow-green crossbands edged with black, throat pale green; dewlap deep yellow to orange in males, dull orange (almost brown) to deep yellow with orange streaking and bluish edge in females.

*Distribution.* Known only from the vicinity of Castillon on the northern slopes of the Massif de la Hotte at elevations between 2200 and 4000 feet (671 and 1220 meters) on the Tiburon Peninsula in Haiti; probably the subspecies occurring at Tardieu near Pic Macaya (see discussion).

*Description of holotype.* An adult male with a snout-vent length of 143 and a tail length of 165 (regenerated); snout scales at level of second canthals 6, 7 vertical rows of loreal scales, 3 scales between supraorbital semicircles, 6/5 scales between interparietal and supraorbital semicircles, vertical dorsals 15, horizontal dorsals 22, ventrals 20, one row of scales between suboculars and supralabials, fourth toe lamellae on phalanges II and III 31, nuchal crest scales moderate, body crest scales low; in life, bright green above with a pair of lateral stripes on each flank powdery pale blue-green, the same color also on the face; throat and neck pale blue-green; venter pale green with pinkish and yellowish suffusions; dewlap deep yellow, almost orange.

*Variation.* The series of three males and three females shows the following variation. The largest male (ASFS V25058) has a snout-vent length of 148, the largest female (ASFS V25060) 141; both are from

Castillon. Snout scales at level of the second canthal range between 5 and 9; the mode is 6 (four specimens). The vertical loreal rows are 6 or 7, with a mode of 7 (five specimens). There are between 3 and 5 scales between the supraorbital semicircles (mode 4). There are modally 4 scales between the interparietal and the supraorbital semicircles; 4 scales are involved in 58 percent of the combinations; actual counts are 4/4 (3), 4/5 (1), 5/5 (1), and 5/6 (1). Vertical dorsals range between 15 and 19 (mean 16.7), horizontal dorsals between 17 and 27 (20.0), and ventrals between 19 and 24 (21.8). Of three males, two have the nuchal crest scales moderate and one has them low; the same situation applies to the three females. All specimens have the body crest scales low. The suboculars are usually separated from the supralabials by one row of scales and are in contact with the supralabials in one individual (17 percent).

Thomas's field notes on three males show the variation in dorsal coloration and pattern. The dorsum was bright green with the flank stripes powdery pale blue-green, this color occurring also on the face. The throat and neck were also pale blue-green and the venter was pale greenish with pink and yellow suffusions. One male (ASFS V9335) also had a white shoulder patch, but other pattern details on this individual were lacking since the specimen was badly damaged. The dewlap in the males was recorded as deep yellow (almost orange) and orange (Pl. 11L6). One female was green to dark olive-green dorsally with two purple flank stripes, edged with dark brown, which were powdery blue-gray anteriorly. The lower sides were spotted and suffused with bright green or yellow-green. The venter was pale green with a pinkish wash in the pectoral region. The second female was marked in quite a different fashion, and the specimen still maintains the pattern after preservation. The dorsum was bright green with four bright yellow-green transverse body bands with black edges; in this specimen longitudinal stripes were also

present but only in the nuchal region, and the venter, including the throat, was pale green. In both females, the dewlaps were recorded as "very dull orange" and "deep yellow, almost brown, anteriorly, with orangish longitudinal striae, each edged with dark gray-green, between striae pale gray-green and most basal striae greenish; edge of dewlap grayish (faintly blue)."

*Comparisons.* *A. r. viculus* is so very different from *A. r. ricordi* in both color and pattern that detailed comparisons are hardly necessary. The black occipital, nuchal, and anterior body blotches of male *ricordi* are absent in male *viculus*, and the longitudinally striped pattern in both sexes of *viculus* does not occur in *ricordi*. The two subspecies differ also in scale counts, as follows: modal number of snout scales at second canthals (*ricordi* 7, *viculus* 6), scales between interparietal and supraorbital semicircles (*ricordi* 5/5, *viculus* 4/4), and much lower means of vertical dorsal and ventral scales (21.1, 24.7 in *ricordi*, 16.7, 21.8 in *viculus*, respectively). The two taxa are similar in number of loreal rows, number of scales between the semicircles, and in relative frequency of contact between the subocular and supralabial scales.

In every way, *viculus* is much closer to *leberi* than to *ricordi*. The basic pattern elements are comparable in these two subspecies, since both are lineate; however, the longitudinal flank stripes in *leberi* are dark, whereas in *viculus* they are light; the single banded female *viculus* is quite different in general aspect from banded *leberi*. As far as scale counts are concerned, the two subspecies differ in the following manner: modal number of snout scales at second canthals (*leberi* 4, *viculus* 6), number of vertical loreal rows (*leberi* 6, *viculus* 7), and scales between supraorbital semicircles (*leberi* 3, *viculus* 4). In mean number of vertical dorsals and ventrals, the two subspecies are very similar, and both have the 4/4 condition as the mode for the interparietal-semicircle relationship.

*Discussion.* Williams (1962: 7-8) con-

sidered the four specimens then available from the central portion of the Tiburon Peninsula as intergrades between *ricordi* and *leberi*. A few more specimens have accumulated since that time; now there are one adult male, one juvenile male, and six adult females from this central region, as follows: HAITI: *Dépt. du Sud*, Pemel, nr. Miragoâne (not mapped) (MCZ 66015-16), Paillant, 1800 feet (549 meters) (ASFS V26535-37); Fond des Nègres (ASFS V26254, USNM 72631, USNM 72633). As preserved, the adult male shows fairly obvious longitudinal streaking of gray and dull green, a few scattered dark flecks or small blotches above the forelimb insertion, and a prominent subocular pale crescent. The adult male is an almost ideal representation of extreme intergradation between *viculus* and *ricordi*, with both pale longitudinal stripes and scattered remnants of the typical *ricordi* extensive body blotching. Three recently collected females in life were green with longitudinal stripes, which were delimited by absence of black flecking that occurs elsewhere on the green ground. In the brown phase, these longitudinal stripes had a reddish wash. In all females, the pale subocular crescent is obvious and bold, and in one female (MCZ 66016) there is an additional preauricular pale area that resembles the condition in nominate *ricordi*. I have no color data on the male dewlaps, but that of one female (ASFS V26535) was dull yellow distally and pale blue, smudged with charcoal, basally; the dewlap scales were yellow-green. The juvenile male (snout-vent length 79) in life had a pattern of longitudinal dorsolateral stripes and dorsal crossbands, with a pale yellow subocular crescent. I interpret these lizards as intergradient between *ricordi* and *viculus*. The central Tiburon localities, however, are far removed from the known localities of *viculus* (110 km) on one hand and of *ricordi* (70 km) on the other. Williams (1965: 7) regarded the Fond des Nègres and Pemel specimens as *ricordi* × *leberi* intergrades, and they could indeed be so

interpreted. Since, however, *leberi* occurs on the southern slopes of the Massif de la Hotte, and *viculus* on the northern slopes of that range, and since all intergradient specimens are from the northeastern regions of the extreme eastern portion of the Massif de la Hotte, it seems much more likely that these central Tiburon specimens are intergradient between *ricordi* and *viculus* on geographic grounds. They do not disagree with my concepts of how intergrades between these two subspecies probably should appear.<sup>1</sup>

<sup>1</sup> Since the above comments on the intergradient specimens were written, Williams has secured a series of 28 lizards (MCZ 132302-29) from St. Croix, 1 mi. (1.6 km) from Paillant, *Dépt. du Sud*, Haiti, from this same general region. There are no color data on the specimens. The measurements (in mm) and scale counts of these lizards, combined with those from the eight previously available specimens, follow. Largest male (MCZ 132325) 155, largest female (ASFS V26535) 148. Snout scales at second canthals 4-9 (mode 6); loreal rows 4-8 (mode 6). Modally 4/4 scales between the interparietal and the supraorbital semicircles; other counts: 3/3 (2), 3/4 (2), 4/5 (4), 5/5 (11), 5/6 (1), 3/5 (1); 4 scales are involved with 50 percent of the combinations. Vertical dorsals range between 14 and 21 (mean 17.0), horizontal dorsals between 15 and 24 (18.3), and ventrals between 16 and 31 (21.4). Of the males, four have the nuchal crest scales moderate and 15 have them low; of the females, one has the nuchal crest scales moderate and 15 have them low. Body scales are low in all adult specimens. The suboculars are modally separated from the supralabials by one row of scales and are in contact with the supralabials in seven lizards (19 percent).

In scale counts, the entire series is much closer to *viculus* than to *ricordi*; however, in some characteristics, the series is closer to *leberi* or to the subspecies yet to be described from extreme southeastern Haiti. In fact, comparison of the scale counts shows that there is little resemblance between the modes and means between these geographically intermediate specimens and nominate *ricordi*, and as a whole they seem much more closely allied to one of the other Tiburon subspecies.

The males in the St. Croix series are variable in pattern but none shows any clear-cut dark blotching, typical of *A. r. ricordi*. Some males are more or less unicolor (medium brown as preserved), whereas others have longitudinal stripes, alternating light and dark, with usually one broad

There remains one other specimen from the distal portion of the Tiburon Peninsula; this is a juvenile male (MCZ 38277) with a snout-vent length of 78, from Tardieu, near Pic Macaya, collected by P. J. Darlington. It is presently dull brown, but there are clear indications of black-edged dorsal crossbands that closely resemble the condition in one of the female paratypes of *viculus*. Tardieu is presently unlocatable on modern maps, but Darlington has indicated to Williams that this place lies just to the north of Pic Macaya, and thus rather close to Castillon. Since there are no juvenile

dark stripe along the upper sides and most prominent. One male has extensive dark brown body markings, vertically oriented and alternating with paler tannish areas to give a more-or-less vertically barred appearance. The pale subocular crescent is very obvious in all males, and there is no indication of a pale preauricular area.

The females are undistinguished. Most are more or less solid green with some scattered paler green scales to give a beadwork effect dorsally, but there are also indications in some specimens of longitudinal paler areas to give a somewhat longitudinally lined appearance. As in the males, the subocular pale crescent is obvious, and there may be a weakly differentiated pale preauricular area.

This newly collected series of *A. ricordi* is puzzling. The entire lot is so like, in general aspect, specimens of *leberi* and *viculus* (and the yet-to-be-named subspecies in southwestern Haiti) and shows so little tendency toward *A. r. ricordi* that it is difficult to interpret them as intergradient between *ricordi* and *viculus*. The adult male (MCZ 66015) noted above in the body of the text is from "Pemel, near Miragoâne," a site that is unlocatable on modern maps. Pemel may be "near Miragoâne" in only the very broadest sense. Specimens that are *known* to have been taken in the Miragoâne-Paillant area show little evidence of intergradation between *viculus* and *ricordi*, and are much closer to the former subspecies.

Everything considered, I strongly suspect that with additional collecting on the central Tiburon Peninsula it is probable that two taxa will be found to occur here in sympatry and without wide areas of intergradation, or that *ricordi*-styled anoles occur close to (but do not intergrade with) *leberi*-styled anoles. The evidence at the moment is far from unequivocal that *ricordi* and *viculus* intergrade in this area. Only much additional collecting along the Tiburon Peninsula will reveal the actuality of the relationships of *A. ricordi* with its southeastern relatives.

*viculus*, I have no concepts of their appearance; on geographic grounds, however, I have little doubt that the Tardieu male is representative of *viculus* rather than of *leberi*.

*Remarks.* It may seem remarkable that there should be two distinctive subspecies of *A. ricordi* in such close geographical proximity; Castillon and Marceline are separated by only 29 kilometers airline, and if the Tardieu specimen is *viculus*, then the distance between the localities for the two subspecies is even shorter. However, between Castillon and Marceline lies the high ridge of the La Hotte, including the culminating peak of that range, Pic Macaya, with an elevation of 7698 feet (2347 meters). Such high and rugged country is probably ecologically unsuitable for *A. ricordi*, and the northern and southern populations associated with the La Hotte have differentiated because of isolation caused by the intervening massif.

The known altitudinal range of *A. r. viculus* is between 2200 and 4000 feet (671 and 1220 meters). The Castillon area, according to Richard Thomas, is generally mesic but much of the original forest has been cut. Still, enough trees and ravine woods remain to offer haven for such a tolerant and adaptable species as *A. ricordi*. One female from south of Castillon was taken by Thomas on the trunk of a large tree about 5 feet (1.5 meters) above the ground; all other ASFS specimens were secured by natives.

The name *viculus* is from the Latin for "hamlet" or "small village" in allusion to Castillon, the type locality.

#### *Anolis ricordi subsolanus* new subspecies

*Holotype.* MCZ 130270, an adult male, from Source Carroyé, near Saltrou, Département de l'Ouest, Haiti, one of a series collected by George Whiteman in March 1972.

*Paratypes.* MCZ 130264-69, MCZ 130271-77, same data as holotype; MCZ 69405, nr. Saltrou, Dépt. de l'Ouest, G. Whiteman, summer 1962.

*Definition.* A subspecies of *A. ricordi*

characterized by the combination of modally 5 snout scales between second canthals, 5 vertical rows of loreal scales, 3 scales between the supraorbital semicircles, 4/4 scales between the interparietal and the supraorbital semicircles, moderate number of vertical dorsal scales (16–21; mean 17.3), moderate number of ventral scales (18–27; mean 21.0), nuchal crest scales rarely moderate, usually low in males, low in females, subocular scales always separated from supralabials scales by one row of scales; males vaguely lineate dorsally with two broad lateral grayish flank stripes, or with three paler (green in life?) crossbands; females like males, or heavily blotched with black laterally and on the occiput, the black lateral markings in the areas that are elsewhere occupied by the gray lateral flank stripes; a pale subocular crescent present and prominent but no pale preauricular blotch; dewlap color unknown.

*Distribution.* Known only from the region about Saltrou, in extreme southeastern Haiti, but see discussion below.

*Description of holotype.* An adult male with a snout–vent length of 144 mm and a tail length of 209 mm (regenerated); snout scales at level of second canthals 4, 6 vertical rows of loreal scales, 3 scales between supraorbital semicircles, 3/4 scales between the interparietal and the supraorbital semicircles, vertical dorsals 18, horizontal dorsals 17, ventrals 19, one row of scales between suboculars and supralabials, fourth toe lamellae on phalanges II and III 33, nuchal crest scales low, body crest scales low; as preserved, dorsum dull dark brown with three prominent blue-green crossbands, more or less confluent middorsally, and outlined in dark brown to black; top of head brown, paler than sides; throat greenish, dewlap dull gray; belly dark gray, underside of hindlimbs green; tail brown.

*Variation.* The holotype and paratype series are composed of 10 males and five females. The largest male (MCZ 130274)

has a snout–vent length of 152, the largest female (MCZ 69405) 150; the male is a topotype, the female is from near Saltrou. Snout scales at level of the second canthals range between 4 and 7; the mode is 5 (six specimens). The vertical loreal rows vary between 5 and 7, with a mode of 5 (eight specimens). There are between 2 and 4 scales between the supraorbital semicircles (mode 3). There are modally 4 scales between the interparietal and the supraorbital semicircles; 4 scales are involved in 58 percent of the combination; actual counts are 3/3 (1), 3/4 (3), 4/4 (4), 4/5 (3), 5/5 (2), and 5/6 (2). Vertical dorsals range between 16 and 21 (mean 17.3), horizontal dorsals between 14 and 23 (17.1), and ventrals between 18 and 27 (21.0). Of 10 males, two have the nuchal crest scales moderate and eight have these scales low; all five females have the nuchal crest scales low. All specimens have the body crest scales low. In all specimens the subocular scales are separated from the supralabials by one row of scales.

I have no color notes in life nor have I seen live specimens of *A. r. subsolanus*. Consequently, my comments on pattern in this subspecies are based solely upon preserved material. In the series of males and females, each sex shows two basic patterns. The more common is a pair of longitudinal flank stripes, the upper being broader, usually dull grayish in contrast to a greenish ground color. In two specimens (one male and one female; MCZ 130267 and MCZ 69405) these stripes are very prominent and black; although they no longer have their integrity in the female, they are still very obvious. In addition, in the female there is black pigment in the occipital region. A pale subocular crescent is present in all specimens and is usually very conspicuous. In two specimens (the holotypic male and a female—MCZ 130266) the dorsal pattern consists of three transverse crossbands that are green, more or less fused middorsally, and outlined with black or dark brown. Many females show the lat-



eral flank stripes much less clearly than do the males, but usually the stripes are at least indicated.

*Comparisons.* In general aspect, *subsolanus* much more closely resembles far western *leberi* and *viculus* than geographically closer *ricordi*. The latter subspecies, however, occurs on the northern side of the Massif de la Selle, whereas the localities for *subsolanus* are to the south of that range. Since I do not know the coloration in life of *subsolanus*, I am unable to compare its pigmentation with that of the other subspecies. The presence of both longitudinally striped and transversely barred specimens in *subsolanus* suggests its affinity with *leberi* and *viculus*. *A. r. subsolanus* differs from *A. r. ricordi* in that the latter has (in its southern populations) dark anterior markings on the occiput and above the forelimb insertions, whereas these markings are absent in *subsolanus*. Additionally, southern *ricordi* are patternless green, whereas *subsolanus* females are longitudinally lined and may have heavy dark anterior markings (somewhat like male *A. r. ricordi*). At the time of Williams's review of *A. ricordi* (1965: 2), there was but a single *A. ricordi* from the Saltrou region; by chance, this specimen (MCZ 69405) is the heavily marked female upon which I commented above. Although Williams (*loc. cit.*) considered it a male, it lacks enlarged postanal scales and a tail "fin," and it is a female. Since female *A. r. ricordi* lack dark anterior markings, this female is really quite different from females of the northern subspecies.

From the western subspecies *leberi* and *viculus*, *subsolanus* differs meristically in the following ways. From *leberi*, *subsolanus* differs in having 5 versus 4 snout scales at the second canthal, 5 versus 6 vertical loreal rows, higher means in vertical dorsal scales and ventral scales, and also lacks specimens that have the suboculars in contact with the supralabials (*leberi* has 48 percent of the specimens with this condition). From *viculus*, *subsolanus* differs in

having 5 versus 6 snout scales at second canthal, 5 versus 7 vertical loreal rows, 3 versus 4 scales between the supraorbital semicircles, and higher means of vertical dorsal scales and ventral scales. In addition to the pattern differences noted above which differentiate *subsolanus* from nominate *ricordi*, *subsolanus* has 5 versus 7 snout scales at the second canthals, 5 versus 7 vertical loreal rows, 3 versus 4 scales between the supraorbital semicircles, 4/4 versus 5/5 scales between the interparietal and the supraorbital semicircles, and lower means in vertical dorsal scales and ventral scales.

*Remarks.* I am once more hampered in my interpretation of *subsolanus* by the large distributional gap between its two stations and any other stations for *A. ricordi* to the west. The absence of specimens from the southern coast, from such well-known areas as Jacmel and Aquin, is truly puzzling. The nearest locality to *subsolanus* along the Tiburon Peninsula is Fond des Nègres (*ricordi* × *viculus*), some 120 kilometers to the west. Still further, the area known to be occupied by *A. r. leberi* lies some 205 kilometers to the west, near the peninsula's tip. Known stations for *A. r. ricordi* are very much closer (40 kilometers) but lie to the north of the Massif de la Selle. Closer even than any of these is *barahonae*; *barahonae* and *subsolanus* are known in this region for localities separated by about 11 kilometers (see comments below), but there is no evidence of intergradation between these two taxa.

It is perhaps pertinent that *leberi*, *viculus*, and *subsolanus* all seem closer in most characteristics to each other than they do to nominate *ricordi*. If it were not for the specimens that I interpret as intergradient between *ricordi* and *viculus* in the Miragoâne-Paillant-Fond des Nègres region, I would be very tempted to consider these three taxa as a species distinct from *A. ricordi*. Much additional material from along the Tiburon Peninsula will perhaps show that my interpretation is wrong.

The name *subsolanus* is from the Latin for "eastern," in allusion to the occurrence of this subspecies in southeastern Haiti. The precise areas where *subsolanus* occurs are a matter of question. I am unable to locate Source Carroyé on any modern map. Williams advised me that Source Carroyé is very near Thiotte (according to the collector, "Source Carroyé is located northeast direction and about ½ mile from the main road after you leave the place of the 'marché,' that market being at Thiotte). The elevation of Thiotte is about 900 meters. The lone specimen from "near Saltrou" also poses the problem of just how "near" this specimen was taken to Saltrou itself. Any information on details of localities or elevations of this and other specimens taken along the Dominico-Haitian border are mandatory. The distance between the Thiotte locality for *subsolanus* and the Pedernales specimens of *barahonae* is about 11 kilometers. It is especially pertinent that *barahonae* is not known, along the Dominico-Haitian border, from the lowlands (where, incidentally, *Anolis coelestinus* is called *saltacocote* by the natives), but that *barahonae* occurs here as an inhabitant of mesic riverine woods at an elevation of 600 feet (183 meters).

### *Anolis barahonae* Williams

*Anolis ricordii barahonae* Williams, 1962. *Breviora*, Mus. Comp. Zool., No. 155: 8.

*Type locality.* Polo, Valle de Polo, Barahona Province, República Dominicana; holotype, MCZ 43819.

*Definition.* A giant species of Hispaniolan *Anolis* characterized by the combination of moderate size (males to 158 mm, females to 148 mm snout-vent length), snout scales at level of second canthal scales 2 to 5 (mode 4), vertical loreal rows 2 to 5 (mode 6), scales between supraorbital semicircles 1 to 4 (mode 2), interparietal scale separated from supraorbital semicircles modally by 4 scales, vertical dorsal scales generally small (15 to 34 in standard-distance), ventral scales relatively small (17 to 29 in standard-distance), nu-

chal crest scales in both sexes rarely high, usually moderate to low, dorsal body crest scales rarely moderate, usually low, subocular scales rarely in contact with supralabial scales; dorsal body coloration basically lichenate gray-green, grays, to browns and black, giving a blotched effect that also occurs in even the smallest juveniles, and rarely (only in juveniles) with any indication of transverse crossbars, or solid brown to grayish with faintly bluish white dark-edged ocelli; dewlap pale yellow to peach in males, pale yellow to pale peach in females; pale subocular crescent absent in adults but indicated in juveniles by a pale subocular spot.

*Distribution.* The Sierra de Baoruco and associated lowlands on the Península de Barahona, República Dominicana, including (probably) the semi-xeric forests of the lowlands south of the Sierra de Baoruco and southern Haiti; altitudinal distribution from sea level to 2600 feet (793 meters) northeast of Las Auyamas, Barahona Province.

### *Anolis barahonae barahonae* Williams

*Type locality.* Polo, Valle de Polo, Barahona Province, República Dominicana.

*Definition.* A subspecies of *A. barahonae* characterized by the combination of modally 4 snout scales between second canthal scales, 4 vertical rows of loreal scales, 2 scales between the supraorbital semicircles, 4/4 scales between the interparietal and the supraorbital semicircles, relatively low number of vertical dorsal scales (15–23; mean 17.2), high number of ventral scales (17–29; mean 22.1), nuchal crest scales moderate to low, body crest scales rarely moderate, usually low, subocular scales usually separated from supralabial scales by one row of scales, both sexes and juveniles patterned with varying shades of gray-green, grays, browns and black, giving a lichenate blotched effect; juveniles with vague indications of three transverse gray bands but that pattern only very rarely even indicated in adults; dewlap pale yellow to pale peach in both sexes, the

female dewlap suffused with gray basally; pale subocular crescent absent in adults but indicated by a clear white subocular spot in juveniles and subadults.

*Discussion.* *A. b. barahonae* has a relatively circumscribed range in the Sierra de Baoruco in the southeastern República Dominicana. Until our 1971 collections, the taxon had been known only from the eastern portion of that massif, but two specimens taken 13.0 mi. (20.8 km) N of Pedernales along the Dominico-Haitian border are unquestionably *A. barahonae*. These individuals differ slightly from more eastern specimens of *A. b. barahonae* in coloration, but they are so close to the nominate subspecies that for the moment I have no hesitancy in regarding them as that taxon.

The series of 33 specimens of *A. b. barahonae* shows the following variation. The largest males (ASFS V29722, MCZ 125504) have snout-vent lengths of 158, the largest female (AMNH 50256) 148; the males are from north of Pedernales and near Polo, and the female is from Barahona. Snout scales at level of second canthals vary between 2 and 5; the mode is 4 (18 specimens). The vertical loreal rows vary between 5 and 8, with a mode of 6 (11 specimens). There are between 1 and 4 scales between the supraorbital semicircles (mode 2). There are modally 4 scales between the interparietal and the supraorbital semicircles; 4 scales are involved with 58 percent of the combinations; actual counts are 3/3 (3), 3/4 (6), 4/4 (13), 4/5 (3), and 5/5 (5). Vertical dorsals range between 15 and 23 (mean 17.2), horizontal dorsals between 15 and 24 (18.2), and ventrals between 17 and 19 (22.1). Of 16 males, seven have the nuchal crest scales moderate and nine have these scales low; of 10 females, three have these scales moderate and seven have them low. Body crest scales are moderate in one male and low in 15, whereas all 10 females have the body crest scales low. The subocular scales are separated from the supralabial scales in 32 of 33 specimens (3 percent).

Exclusive of the male and female from

north of Pedernales, eastern specimens of *A. b. barahonae* are lichenate or blotched with gray-green, grays, browns, and black in a random pattern, although occasional individuals show remnants of the slightly more obviously banded condition of the juveniles. No specimen has been recorded in the field as being bright green, and in general the tones of green in *barahonae* are dull and grayish. Some specimens (especially ASFS V30921, a male) were recorded as being gray, heavily blotched with black, and thus without any green tints whatsoever. The dewlap color in males varies between pale peach and peach, and in females between pale peach and yellow.

The Pedernales specimens were recorded in life as being dark brown to gray dorsally, obscurely banded with tannish. The heads were tan above, the eyeskin pale gray, and the female had the upper surfaces of all limbs banded green and dark brown. The most noteworthy difference between these western specimens and those from the eastern uplands of the Sierra de Baoruco and its associated lowlands is that the dewlaps in both sexes were pale yellow, that of the female suffused with gray basally.

Available juveniles and subadults vary in length between 62 and 95. The juveniles are colored and patterned essentially like the adults, except that three pale grayish crossbands are vaguely indicated in most specimens. These bands are quite indistinct and much obscured by the lichenate *barahonae* pattern. Some juveniles were recorded as being banded and mottled pale gray, dull pea-green, and black, with a black nuchal patch and a white nuchal crescent on each side, whereas others were recorded as crossbanded gray and dusky, with some greenish on the lips, and the tails banded gray and dusky to cream.

*Remarks.* Specimens secured by myself and parties have all been taken in wooded situations, between elevations of 600 feet and 2600 feet (183 and 793 meters). Riverine woods and the large shade trees in the upland *cafetales* of the Sierra de Baoruco offer optimum habitat for the species. Both

adults and juveniles were secured sleeping at night; in general, the juveniles sleep lower on shrubs and low trees, whereas adults sleep higher (up to 15 feet—4.6 meters) on limbs, branches, and woody vines. At night, despite the absence of bright greens in the coloration, the lizards are quite obvious because their pale grayish hues contrast to the adjacent greenery. All ages of *A. b. barahonae* sleep exposed, as do other Hispaniolan giant anoles. The pair from 13.0 mi. N Pedernales were secured in rich riverine woods at an elevation of 600 feet (183 meters); this is purely a gallery forest situation, since in this region the open slopes are clad in *Acacia* forest or dry scrubby woodlands, whereas rivers and creeks support much more luxuriant arboreal growth.

Almost all localities for *A. b. barahonae* are in the highlands. However, the lizard presumably occurs in coastal forested regions as well. There are specimens from the city of Barahona (which is coastal) and from halfway between Enriquillo and Oviedo, which is presumed to be coastal or nearly so. A third specimen from Enriquillo likewise is presumably from a coastal locality. However, in each of these cases, it is possible that the lizards were secured in the adjacent Sierra de Baoruco; this mountain range comes abruptly to the coast between Barahona and Enriquillo, and it would be a simple matter to label specimens from non-coastal localities as having come from coastal populated areas. Although negative evidence at best, we have never ourselves secured *A. barahonae* along this coastal region, and residents of Barahona responded negatively when approached to collect this lizard for us.

*A. b. barahonae* is known from a locality (13.0 mi. N Pedernales) that is only (presumably) 11 kilometers from a locality (Thiotte) where *A. r. subsolanus* occurs. There are no other localities where these two species approach each other, although, since the northern slopes of the Sierra de Baoruco are confluent with the northern slopes of the Massif de la Selle and its affil-

iates, it is not unlikely that somewhere along these northern reaches *A. barahonae* comes into contact with *A. r. ricordi*. There is no obvious reason for *A. b. barahonae* to be promptly replaced by *A. r. subsolanus* at the Dominico-Haitian border; the political boundary on these southern slopes is the Río Pedernales, a small stream that surely offers no obstacle for these arboreal lizards. It follows that *A. b. barahonae* must occur in southeastern Haiti. Thus, as previously noted, the accuracy of the *subsolanus* localities is more than academic. It is possible that in southeastern Haiti, *A. barahonae* is a more lowland lizard and *A. ricordi (subsolanus)* occurs on the higher and better forested slopes of the Massif de la Selle—the division may thus be altitudinal as well as ecological. The precise relationships between these two species remain to be determined; only further detailed collecting in extreme southeastern Haiti will reveal the situation there. As far as distinguishing *A. r. subsolanus* from *A. b. barahonae*, there is no problem, since the styles of pattern (and presumably coloration) are so very different as to preclude confusion. If intergradation between *subsolanus* and *barahonae* occurs (and since I here regard *barahonae* as a species distinct from *ricordi*, I am obviously convinced that it does not), then it must take place very quickly, in a distance of some 11 kilometers, since *subsolanus* and the Pedernales *barahonae* are completely different and typical of their own populations, without any indication of intergradation between them.

*Specimens examined.* REPÚBLICA DOMINICANA: *Barahona Province*, Barahona (AMNH 50255–56); 14 km SW Barahona, 1200 feet (366 meters) (ASFS V23460–63, ASFS V30263–70); Valle de Polo (MCZ 56141, AMNH 51235–37, AMNH 51240, AMNH 51036); nr. Polo (MCZ 125504–06); Las Auyamas (ASFS V30921); 8 km NE Las Auyamas, 2600 feet (793 meters) (ASFS X9676); Hermann's finca, nr. Paraiso (AMNH 51231–33); Enriquillo (AMNH 51241); *Pedernales Province*, half-

way between Enriquillo and Oviedo (AMNH 51230); 13.0 mi. (20.8 km) N Pedernales, 600 feet (183 meters) (ASFS V29722-23); locality unknown (AMNH 51229).

*Anolis barahonae albocellatus*  
new subspecies

*Holotype.* MCZ 125611, an adult male, from 13.1 mi. (21.0 km) SW Enriquillo, Pedernales Province, República Dominicana, taken by Richard Thomas on 10 December 1964. Original number ASFS V4422.

*Definition.* A subspecies of *A. barahonae* characterized by the combination of 4 snout scales between second canthal scales, 7 vertical rows of loreal scales, 3 scales between the supraorbital semicircles, 4/4 scales between the interparietal and the supraorbital semicircles, apparently relatively high number of vertical dorsal scales (19), high number of ventral scales (26), nuchal crest scales high, body crest scales low, subocular scales separated from supralabial scales by one row of scales, male (females unknown) dorsal ground color nonlichenate brown to grayish with white (faintly bluish) randomly placed dark-edged ocelli, head light brown above, dewlap pale yellow with a pink margin, and a pale subocular spot.

*Distribution.* Known only from the type locality, but presumably distributed through the semi-arid forests of the Península de Barahona south of the Sierra de Baoruco (see discussion).

*Description of holotype.* An adult male with a snout-vent length of 150 and a tail length of 265; snout scales at level of second canthal 4, 7 vertical rows of loreal scales, 3 scales between interparietal and supraorbital semicircles, vertical dorsals 19, horizontal dorsals 23, ventrals 23, one row of scales between suboculars and supralabials, fourth toe lamellae on phalanges II and III 34, nuchal crest scales high, body crest scales low; in life, dorsum brown to grayish, not lichenate, with randomly scattered white (faintly bluish) dark-edged

ocelli involving from 1 to 4 scales; venter white with gray mottling or stippling; dewlap pale yellow with pink along its outer margin; upper surface of head light brown, with large pale subcircular areas anterior to the ear opening, and a conspicuous pale blotch below the eye; soles of hands and feet conspicuously pale yellow.

*Comparisons.* No mensural nor meristic characters separate *albocellatus* from *barahonae*. On the other hand, the distinctive coloration, pattern, and dewlap color of *albocellatus* are very different from those of *barahonae*, and the presence of high nuchal crest scales likewise differentiates *albocellatus* from the moderate to low scales in *barahonae*. More detailed comparisons are impossible, but certainly *albocellatus* is quite distinctive when compared with *barahonae*.

*Discussion.* It may seem foolhardy to name a subspecies of *A. barahonae* from a single specimen whose locality is only 11 kilometers from a presumed locality for *A. b. barahonae* (half way between Enriquillo and Oviedo). The holotype of *A. b. albocellatus* is that lizard about which Williams (1965: 4) commented, saying it "is typical in squamation but peculiar in having very distinct small *light* spots on the flanks. . . . It will be recalled that it was a specimen from Enriquillo (AMNH 51241) that caused some hesitation when *barahonae* was first described. In AMNH 51241 the pattern was thought to be obscure banding; the present specimen clearly shows spots tending to be vertically aligned—a condition which is easily transformed into vertical banding. It is possible that the *ricordii* populations in the vicinity of Enriquillo consistently show a distinctive pattern though characteristically *barahonae* in squamation."

The specimen (AMNH 51230) from half-way between Enriquillo and Oviedo is a young male with a snout-vent length of 121. Since this lizard presumably came from the lowlands of the Península de Barahona, it might logically be expected to be *albocellatus*. However, the lizard is now

drab patternless brown, and there are no indications that it was ever spotted. Presumably *albozellatus* and *barahonae* intergrade between Enriquillo (which lies at the extreme southeastern corner of the Sierra de Baoruco) and Oviedo (which lies well down on the Península de Barahona).

Several facts have prompted my naming this lonely specimen. First, I have examined the Enriquillo specimen noted by Williams, and, although it shows some indication of vertical crossbars, they are not any more conspicuous than those in some more recently taken *A. b. barahonae* from the Baoruco highlands (Williams examined only 17 *barahonae* at the time of its original description; I have studied almost twice this number). Secondly, the xeric to semi-arid region south of the Sierra de Baoruco has come to be known as an area of local differentiation at the subspecific level for a variety of reptiles; this alone is no reason for naming *albozellatus*, of course. Thirdly, although since 1964 when the holotype was collected both I and others have spent considerable time on the Península de Barahona and in the vicinity of Oviedo, we have never seen or secured another *A. barahonae* in this region. In September 1966, the very severe hurricane Inez passed directly across the Península. What had once been high-canopied semi-arid forest (as at Oviedo) has been either totally destroyed or been reduced (by 1969) to a landscape of bare snags with some leafy growth just now beginning to appear but at a much lower canopy-level than previously. The changes between the Oviedo area in 1964 and 1969 are so massive that, upon my first visit there after Inez, I was unable to orient myself in reference to our older collecting localities! Certainly this entire region has suffered greatly, and, with the destruction of trees, it seems reasonable to assume that *A. barahonae* has suffered equally. The population may never have been high, since such semi-arid woods are not at all optimal habitat for any of the Hispaniolan giant anoles, and the destruction of the habitat must surely

have affected *A. b. albozellatus* adversely. Since persistent visits to this area have yielded no new material, and since the lizard may presently be very rare, I have decided upon the present course rather than wait in hope for someone to secure a second (or more) lizard.

*Remarks.* The Península de Barahona has been shown to have distinctive subspecies (or even species) of a variety of reptiles. Species that have described endemic subspecies south of the Sierra de Baoruco include: *Sphaerodactylus difficilis* Barbour, *Leiocephalus barahonensis* Schmidt, *Ameiva chrysolaeama* Cope, *Ameiva lineolata* Duméril and Bibron, *Amphisbaena gonavensis* Gans and Alexander, and *Dromicus parvifrons* Jan. Endemic Península de Barahona species are: *Anolis longitibialis* Noble, *Typhlops syntherus* Thomas, *Leptotyphlops pyrites* Thomas, and *Uromacer wetmorei* Cochran. Only one amphibian, *Eleutherodactylus alcoae* Schwartz, is restricted to the Península. To the former list can now be added *Anolis barahonae*. The eastern half of the Península, although xeric, was originally clothed in dry forest, much of it upon a series of limestone terraces, the highest point of which is the Loma Gran Sabana, having an elevation of 1082 meters in the north and descending to Cerro Caballo, and Loma de Chendo, having elevations of 322 and 233 meters, respectively, to the south. West of this ridge, the land descends abruptly to *Acacia-cactus* desert to the east of Cabo Rojo, and this habitat continues to the Dominico-Haitian border at Pedernales. Presumably, *A. b. albozellatus* occurs throughout the eastern half of the Península in the formerly high-canopied forests of the limestone terraces.

The holotype was secured by Richard Thomas during the day in a viny tangle in semi-xeric woods near Oviedo; the lizard was in an edge situation, since beyond the dense vine tangle the woods thinned to more scrubby and cleared areas.

The name *albozellatus* is from the Latin

"albus" for "white" and "ocellus" for "eye," in allusion to the white spots that are typical of the holotype.

### *Anolis baleatus* Cope

*Eupristis baleatus* Cope, 1864, Proc. Acad. Nat. Sci. Philadelphia, p. 168.

*Type locality.* Santo Domingo; holotype, British Museum (Natural History) 1946.8.29.22.

*Definition.* A giant species of Hispaniolan *Anolis* characterized by the combination of large size (males to 180 mm, females to 148 mm snout-vent length), snout scales at level of second canthal scales 2 to 5 (modally 2 or 4, by population) but usually 2 or 3 (75 percent), vertical loreal rows 5 to 10 (modes by population 6, 7 or 8), scales between supraorbital semicircles 1 to 4 (modally 3), interparietal scales separated from supraorbital semicircles modally by 4 or 5 scales, vertical dorsal scales generally small (12 to 24 in standard-distance), ventral scales relatively small (15 to 34 in standard-distance), nuchal crest scales in both sexes very high to high, rarely moderate, never low, body crest scales usually high to moderate, rarely low, subocular scales usually not in contact with supralabial scales; dorsal body coloration and pattern usually some shade of green, varying from dull greenish brown to bright emerald green, either conspicuously crossbanded with few (3 or 4) to very many crossbands, in the latter condition the lizards appearing tigroid, or, on the other hand, without crossbanding but blotched, never striped or with dark occipital, nuchal, or lateral dark markings, dewlap in males from pale yellow to vivid orange, in females from brownish or very pale yellow to orange or gray, often suffused with grayish or brownish, or nearly white, chin and throat yellowish, green, or orange, often with a dark dotted or mottled or reticulate pattern, and pale subocular crescent absent in adults.

*Distribution.* The eastern two-thirds of the República Dominicana, from Puerto

Plata, Santiago, and La Vega provinces south to San Cristóbal Province and the Distrito Nacional, and east to La Altagracia Province; also in and near the Sierra Martín García and the southern slopes of the Cordillera Central and the Sierra de Ocoa in Azua and Peravia provinces; occurs on Isla Saona but unrepresented by specimens from that satellite island.

### *Anolis baleatus baleatus* Cope

*Type locality.* "Santo Domingo"; here restricted to the vicinity of Puerto Plata, Puerto Plata Province, República Dominicana (see rationale for this restriction below).

*Definition.* A subspecies of *A. baleatus* characterized by the combination of modally 4 snout scales between second canthal scales, 7 vertical rows of loreal scales, 3 scales between the supraorbital semicircles, moderate number of vertical dorsal scales (14–21; mean 17.5), high number of ventral scales (19–34; mean 23.8), nuchal crest scales very high (usually) to high or moderate (rarely), body crest scales high (rarely) to moderate (usually), subocular scales always in contact with supralabial scales, males from pale green or rich bluish green to brown dorsally, with three bright yellow to darker green or greenish brown irregular crossbands, lower sides usually bright yellow, females apparently with the same body patterns and hues as the males (see below), throat in males bright yellow to bright orange, rarely mottled with brown, dewlap in males always vivid to brilliant orange, and the upper surfaces of hindlimbs bluish green, conspicuously barred with bright yellow.

*Distribution.* Known from the Cordillera Septentrional and the northern coastal plain of the República Dominicana, from Puerto Plata, Espaillat, and Santiago provinces, but probably occurring elsewhere in this range and to the north of it; specimens from Los Bracitos, Duarte Province, should also be included (on geographical grounds) with *A. b. baleatus*, since Los Bracitos lies

in the eastern extremity of the Cordillera Septentrional, but the specimens are old and greatly discolored and I have not considered them as pertaining to the nominate subspecies.

*Discussion.* *Eupristis baleatus* Cope was named from a single specimen from "Santo Domingo." I have examined the holotype, collected by A. Sallé, in the British Museum (Natural History). Considering its length of time in preservative, it is in excellent condition and shows a striking pattern of three bold pale body crossbands on a darker dorsal ground color, contrastingly banded hindlimbs and tail, and immaculate throat. The specimen is a female, and, unfortunately, I have only two adult females from the range ascribed above to *A. b. baleatus*; both are without color data in life. At least one of them (MCZ 57717) resembles the pattern of the *baleatus* holotype to a striking degree.

Through the courtesy of Ernest E. Williams, I have a copy of a map prepared by William J. Clench which shows the localities where A. Sallé is known to have collected. Considering the era of his travels (the mid-1800's), Sallé traveled widely throughout the República Dominicana, from (in the north) Puerto Plata, Pontón, Santiago, Moca, La Vega and Cotuí, east to Higüey, Cabo Engaño and San Rafael del Yuma, in the eastern interior to Hato Mayor and El Seibo, along the southern coast from Santo Domingo to San Cristóbal, Baní, Azua, Barreras, and Barahona, and into the Valle de San Juan to the city of San Juan. He also ascended the southern slopes of the Cordillera Central near San José de Ocoa. Although much of Sallé's Dominican travels was in territory of *A. baleatus*, he was also in the ranges of *A. ricordi* and *A. barahonae*. The holotype, as Williams (1962: 2, footnote 1) pointed out, has elongate nuchal crest scales, and there is no doubt that the name *baleatus* is applicable to some population that possesses this character. Since Sallé traveled within the range of the northern population of *A. bealeatus*, I have restricted the type

locality of the name to the vicinity of a major city that is presumed to lie within the area to which I ascribe this boldly cross-banded subspecies.

The series of 15 *A. b. baleatus* shows the following variation. The largest males (ASFS V33558, ASFS V18123) have snout-vent lengths of 148, and the largest female (MCZ 128380) has the same dimension. These three lizards are all from the Cordillera Septentrional north of Puesto Grande. Snout scales at level of the second canthal vary between 2 and 4; the mode is 4 (eight specimens). The vertical loreal rows vary between 5 and 9, with a mode of 7 (six specimens). There are 3 scales between the supraorbital semicircles in all specimens. There are modally 5 scales between the interparietal and the semicircles; 5 scales are involved in 63 percent of the combination; actual counts are 4/4 (1), 4/5 (4), 5/5 (7), 5/6 (1), 6/6 (1), and 5/7 (1). Vertical dorsals range between 14 and 21 (mean 17.5), horizontal dorsals between 16 and 26 (19.7), and ventrals between 19 and 34 (mean 23.8). Of nine adult males, six have the nuchal crest scales very high, two have these scales high, and one has them moderate. Of three females, the nuchal crest scales are very high in two and high in one. The body crest scales are high in one male and moderate in eight males; in three females, the body crest scales are high in one and moderate in two. All specimens have the subocular scales in contact with the supralabial scales.

Males are usually conspicuously cross-banded. Specimens have been recorded as pale green with three irregular darker green crossbands, brown with three faint green-brown crossbands, or rich bluish green with three bright yellow crossbands. The lower sides are bright yellow (which grades into a grayish venter), and this color also occurs on the throat, which varies from yellowish to bright yellow or orange, occasionally mottled with brown. The dewlap is brightly colored; it has been recorded as "vivid orange," "bright vivid orange," "brilliant yellow-orange," and "very bright



orange." The upper surface of the head is reddish brown and the hindlimbs are green to bluish green, barred with bright yellow. In general, male *A. b. baleatus* are vividly patterned and colored lizards. I have collected no females myself and thus have no notes on this sex from life; however, one recently (1971) collected female (MCZ 128380) still is dark green with several thin vertical pale crossband remnants on the sides and back, and another female (MCZ 57717) is contrastingly patterned in dark and pale green, the latter occurring as vertical crossbands.

The series includes three subadults, with snout-vent lengths between 73 and 83. One of these (ASFS V33559; snout-vent length 80) was medium brown dorsally with a black postocular streak and an orange dewlap that was streaked with black basally. None of the subadults as preserved shows any crossbanding or other pattern elements. It is interesting that the only Hispaniolan giant anole taken at night sleeping in the brown phase is the above mentioned subadult.

*Remarks.* All ASFS specimens collected by myself and parties were secured at night while the lizards were sleeping. Typical situations are in gallery forest and *cafetales* along mountain streams in the Cordillera Septentrional. Favored sleeping sites for these lizards in the region are pendant and semi-pendant woody vines; Fowler reported that one adult male secured by him at night was not asleep and was slowly ascending a tree trunk as Fowler approached. It is possible that this lizard had been disturbed by the bright light from Fowler's flashlight or by unfamiliar movements and noises, since I doubt that any of the Hispaniolan giant anoles are normally active at night. However, all these lizards waken quickly when disturbed and unless promptly secured, gradually wander away into the greenery and are lost to view. One of the juveniles was secured only 6 feet (1.8 meters) above the ground, whereas one of the adults was shot from a tree limb 35 feet (10.7 meters)

above a mountain stream. The specimen from near Sosúa was taken in dense hardwoods on a limestone substrate.

The altitudinal distribution of *A. b. baleatus* is from 1400 to 2200 feet (427 to 671 meters), but the taxon occurs much lower than this, since the specimen from near Sosúa was in limestone hills near sea level.

*Specimens examined.* REPÚBLICA DOMINICANA: *Espailat Province*, 2 km N Puesto Grande, 1400 to 2200 feet (427 to 671 meters) (ASFS V18048, ASFS V33557-59); 5 km N Puesto Grande (MCZ 128380); 11 km N Puesto Grande, 2100 feet (641 meters) (ASFS V18123, ASFS V18292): *Puerto Plata Province*, 11 km SE Sosúa (ASFS V1717); *Santiago Province*, Pena (MCZ 57713, MCZ 57715-19); no locality other than Santo Domingo—British Museum (Natural History) 1946.9.28.22—holotype of *Eupristis baleatus*.

#### *Anolis baleatus multistruppis* new subspecies

*Holotype.* USNM 193975, an adult male, from Guaigüí, 3 mi. (4.8 km) S La Vega, La Vega Province, 300 feet (92 meters), República Dominicana, one of a series taken by Danny C. Fowler, Albert Schwartz, and Bruce R. Sheplan on 9 November 1971. Original number ASFS V33680.

*Paratypes.* ASFS V33681-86, MCZ 125612-15, CM 54107-12, same data as holotype; ASFS V18547-50, same locality as holotype, J. R. Dennis, J. A. Rodgers, Jr., and A. Schwartz, 27 July 1969.

*Definition.* A subspecies of *A. baleatus* characterized by the combination of modally 2 snout scales between second canthal scales, 7 vertical rows of loreal scales, 3 scales between the supraorbital semicircles, 4/4 scales between the interparietal and the supraorbital semicircles, high number of vertical dorsal scales (14-24; mean 18.6), moderate number of ventral scales (18-29; mean 22.3), nuchal crest scales very high to high (usually) to moderate (rarely), body crest scales high (rarely) to moderate (usually), subocular scales almost al-

ways separated from supralabial scales by one row of scales, both sexes as adults retaining the complex juvenile pattern of many fine dark green, green, and yellow vertical bars, occasionally (in females) bright pea green with three pale green crossbars more prominent than any other dorsal pattern elements, throat green to yellow green, dewlap in males very pale yellow to very pale peach, suffused basally with pale gray, in females very pale yellow to pale yellow, strongly suffused with pale gray to entirely pale gray.

*Distribution.* Known only from the type locality but presumed to occur on the northern and probably eastern lower faces of the Cordillera Central in proper habitats; possibly extending as far west on the northern face of this range as the Río Bao near Los Montones (see discussion below).

*Description of holotype.* An adult male with a snout-vent length of 146 and a tail length (broken) of 97; snout scales at level of second canthals 2, 9 vertical rows of loreal scales, 3 scales between the supraorbital semicircles, 4/4 scales between the interparietal and the supraorbital semicircles, vertical dorsals 21, horizontal dorsals 25, ventrals 29, one row of scales between the suboculars and supralabials, fourth toe lamellae on phalanges II and III 30, nuchal crest scales high, body crest scales moderate; in life, dorsal body pattern of many fine green, dark green, and yellow crossbands, upper surface of head grayish tan in contrast to the brighter dorsal colors, chin and throat very pale yellow or yellow-green with no clearly delineated darker green markings, and dewlap very pale yellow, much suffused basally with gray.

*Variation.* The series of 21 *A. b. multistrappus* is composed of eight males and 13 females. The largest male has a snout-vent length of 146 and is the holotype. The largest female (ASFS V33684) has a snout-vent length of 136 and is a topotype. Snout scales at the level of the second canthals range between 2 and 5; the mode is 2 (15 specimens). The vertical

loreal rows vary between 6 and 9, with a mode of 7 (nine specimens). There are 2 or 3 scales between the supraorbital semicircles (mode 3). There are modally 4 scales between the interparietal and the supraorbital semicircles; 4 scales are involved in 58 percent of the combinations; actual counts are 3/3 (1), 3/4 (2), 4/4 (8), 4/5 (5), 5/5 (3), and 5/6 (1). Vertical dorsals range between 14 and 24 (mean 18.6), horizontal dorsals between 17 and 25 (20.6), and ventrals between 18 and 29 (22.3). All three adult males have the nuchal crest scales high, and of ten females, three have these scales very high, five have them high, and two have them moderate. All three males have the body crest scales moderate, whereas two females have the body crest scales high, eight have them moderate, and one has them low. In all but one specimen (5 percent), the suboculars are separated from the supralabials by 1 scale.

Adults of both sexes retain the juvenile multibanded pattern of dark greens, medium greens, and yellow. One adult female was recorded as bright pea-green with three pale green crossbands, which are remnants of the hollowed yellow centers of the five or six dark brown to dark green crossbands. In general, the total aspect of adults and juveniles is of a contrastingly tigroid lizard, the stripes varying shades of greens, yellows, and (in the dark phase) browns. The upper surface of the head is grayish tan in males and tannish green in females, and the throat is unmarked green to yellow-green. One of the most striking features of *A. b. multistrappus* is the faded dewlap coloration. In males, the colors vary between very pale yellow and very pale peach, basally suffused with pale gray. In females, the dewlap is even more drab, with pale yellow the basic color, but the gray suffusion may be so extensive as to limit the yellow pigment to the dewlap edge or to cause the dewlap to be pale gray.

The type series includes seven juveniles and subadults, with snout-vent lengths be-

tween 47 and 99. These present a uniform aspect of multiple dorsal bands as described above, and even the largest of the subadults clearly shows this condition. In life, a small juvenile (snout-vent length 53) was recorded as pale gray with a yellow-green head and about four reversed chevrons between the neck and the hindlimbs, these chevrons being the pale hollowed remnants of the darker crossbands, which, in this individual, are obscure. The small lizard also had a black postocular line and a charcoal postangular smudge. The juvenile and subadult dewlaps are pale flesh to very pale yellow, somewhat suffused basally with light to very dark gray.

*Comparisons.* Meristically, *multistruppus* differs from nominate *baleatus* in having 2 (rather than 4) snout scales at the level of the second canthals, 4/4 (rather than 5/5) scales between the interparietal and the supraorbital semicircles, and in having slightly less ventrals (means 22.3 and 23.8). There is also a strong tendency for both sexes of *baleatus* to have very high nuchal crest scales, whereas these scales are more often only high in *multistruppus*. It is in color and pattern that these two subspecies differ most strikingly. In the introduction to the present paper I commented on my having collected specimens from the Cordillera Septentrional and Guaigüí on two succeeding days, and on the color and pattern differences being at once very apparent. The bright orange throat and dewlap of *baleatus* contrast quite obviously with the pale yellow to gray dewlaps in *multistruppus*. The body patterns of the two subspecies likewise are quite different, with the finely and multi-banded *multistruppus* in contrast to the irregularly banded dorsum with only three bands in *baleatus*.

*Discussion.* *A. b. multistruppus* is known with certainty from only a single locality, which lies at the foot of the Cordillera Central at an elevation of 300 feet (92 meters). The locality is unique in that it represents an extensive stand of original

lowland forest in this region, hardwood forest which abuts upon the lower pine-clad slopes of the mountains. This locality, Guaigüí, is separated from the known range of *A. b. baleatus* by the Valle de Cibao, which here is a moderately arid and broad valley presently very much under cultivation. I have seen no specimens from this intervening valley but surely the lizards occur there, despite the cultivation.

One other specimen requires mention. This is a subadult male (ASF5 V33856) with a snout-vent length of 55, from 3.4 mi. (5.4 km) SE Los Montones, Río Bao, 1600 feet (488 meters). This locality is on the northern slopes of the Cordillera Central, some 45 kilometers to the west of Guaigüí, but separated from Guaigüí by intervening, moderately high spurs of the Cordillera Central. The specimen was secured by a local boy in an area of high-canopied forest along the Río Bao. A visit by ourselves to this area at night yielded no *A. baleatus*, despite exceptionally fine conditions. The lizard in life was all green except for a white preaxillary bar, and the dewlap was dull brownish. This specimen in no way resembles comparably sized juvenile *multistruppus*, in either color or pattern. Its status remains uncertain.

To the east, *multistruppus* must come in close contact or intergrade with the subspecies that occurs throughout the northeastern portion of the República Dominicana; details of this contact will be discussed under the account of the latter subspecies. Likewise, to the south, *multistruppus* may come into contact with the subspecies in the high Cordillera Central; details of this association will be discussed under the description of the Central subspecies.

*Remarks.* All specimens of *A. b. multistruppus* were collected on two occasions, while the lizards slept at night. Young individuals were taken from generally low situations on shrubs and the lower branches of trees, whereas adults were observed sleeping in the higher canopy; the total range of heights was between 5 feet

and 25 feet (1.5 and 7.6 meters). The Río Camú flows through the Guaigüí woods, and many individuals were taken from tree limbs that overhang the river.

The name *multistruppus* is from the Latin "multus" for "many" and "struppus" for "thong, strap," in allusion to the many dorsal crossbands in this subspecies.

***Anolis baleatus sublimis* new subspecies**

*Holotype.* CM 54104, an adult male, from 0.3 mi. (0.5 km) E El Río, 3800 feet (1159 meters), La Vega Province, República Dominicana, taken by Richard Thomas on 26 June 1963. Original number ASFS X8114.

*Paratypes.* ASFS X8558, 4 km SW El Río, 4000 feet (1220 meters), La Vega Province, República Dominicana, R. F. Klinikowski, 2 July 1963; USNM 62104-05, El Río, La Vega Province, República Dominicana, W. L. Abbott, 19 May 1919; AMNH 41294, El Río, La Vega Province, República Dominicana, G. K. Noble, 31 August 1922; ASFS V18594, La Palma, 14 km E El Río, 3500 feet (1068 meters), República Dominicana, J. A. Rodgers, Jr., 30 July 1969; MCZ 107019-21, La Palma, 14 km E El Río, 3500 feet (1068 meters), La Vega Province, República Dominicana, native collectors for E. E. Williams and A. S. Rand, 25-31 July 1968; MCZ 128397, La Palma, 14 km E El Río, 3500 feet (1068 meters), La Vega Province, República Dominicana, T. P. Webster and R. B. Huey, 6 July 1971; ASFS V18363-69, 8 km W Jarabacoa, 2000 feet (610 meters), La Vega Province, República Dominicana, J. A. Rodgers, Jr., 19 July 1969.

*Definition.* A subspecies of *A. baleatus* characterized by the combination of modally 2 snout scales between second canthal scales, 7 vertical rows of loreal scales, 3 scales between the supraorbital semicircles, 4/4 scales between the interparietal and the supraorbital semicircles, high number of vertical dorsal scales (17-21; mean 19.2), high number of ventral scales (19-32; mean 25.1), nuchal crest scales very high (usually) to high (rarely), body crest

scales always high, subocular scales almost always separated from supralabial scales by one row of scales, both sexes either marbled or blotched with varying shades of greens or browns, or dark brown banded with dull cream, never with many fine crossbars, venter in males pale green, flecked with darker green, and male dewlaps pale yellow-orange to orange, gray basally and marbled green anteriorly, female dewlaps irregularly yellow-orange with brown spotting.

*Distribution.* The uplands of the Dominican Cordillera Central at elevations between 2000 and 4000 feet, in the area between El Río, La Palma, and Jarabacoa.

*Description of holotype.* An adult male with a snout-vent length of 143 and a tail length of 167 (regenerated); snout scales at level of second canthals 3, 7 vertical rows of loreal scales, 2 scales between the supraorbital semicircles, 4/4 scales between the interparietal and the supraorbital semicircles, vertical dorsals 20, horizontal dorsals 21, ventrals 29, one row of scales between the suboculars and supralabials, fourth toe lamellae on phalanges II and III 31, nuchal crest scales and dorsal body crest scales high; in life, dorsum dark brown banded with dull cream, this pattern extending onto the tail, eyeskin grayish with a pale yellow eyering, venter pale green, flecked with darker green, chin and throat concolor with and patterned like venter, dewlap pale yellow-orange, grayish basally and marbled with green anteriorly.

*Variation.* The series of 18 *sublimis* is composed of nine males and nine females. The largest male (USNM 62104) has a snout-vent length of 150, the largest female (MCZ 107021) 141; the male is from El Río, the female from La Palma. Snout scales at the level of the second canthals range between 2 and 5; the mode is 2 (10 specimens). The vertical loreal rows vary between 6 and 9, with a mode of 7 (eight specimens). There are 2 to 4 scales between the supraorbital semicircles (mode 3). There are modally 4 scales

between the interparietal and the supraorbital semicircles; 4 scales are involved in 65 percent of the combination; the actual counts are 3/3 (1), 3/4 (1), 4/4 (10), 4/5 (1), 5/5 (3), and 5/6 (1). Vertical dorsals range between 17 and 21 (mean 19.2), horizontal dorsals between 17 and 24 (20.4), and ventrals between 19 and 32 (25.1). Of the six adult males, three have the nuchal crest scales very high and three have them high, whereas all five adult females have these scales very high. All adults of both sexes have the dorsal body crest scales high. Three lizards (17 percent) have the subocular scales in contact with the supralabials.

In the green phase, adults of both sexes are irregularly marbled or blotched with varying shades of green or browns, whereas in the brown phase, the body is dark brown with three cream crossbands. In males the venter and the chin and throat are pale green, flecked or mottled with darker green, the flecking or mottling variably expressed in the series. The dewlap in males is pale yellow-orange to orange, gray basally and often with marbled green markings anteriorly, these markings being a continuation of the dark green throat markings. In females, the dewlap is irregularly mottled with yellow-orange and has some brown spotting. As preserved, the series is remarkably uniform in showing vague pale-and-dark marblings or mottlings, and no adult shows any indication of crossbands.

The series of paratypes includes six juveniles and subadults, with snout-vent lengths between 49 and 94. The three smallest of these (49-70) are presently patternless, as is also a specimen with a snout-vent length of 73. Two other subadults (snout-vent lengths 75 and 94) show vague indications of mottled dorsum with (in the larger) three slightly paler dorsal crossbands. The larger of these two specimens was recorded in life as dark green dorsally with pale green crossbands, and the interbars are mottled or marbled with greens. The smallest juvenile noted

above was bright yellow-green in life and had the venter slightly paler yellow-green; the concealed surfaces of the thighs were lead-gray, bordered above by buffy. The absence of pale crossbars in very young specimens of *sublimis* is noteworthy.

*Comparisons.* There are no meristic counts that separate *sublimis* from adjacent *multistruppis*; the means of ventral scales in the two subspecies differ slightly, however (22.3 in *sublimis*, 25.1 in *multistruppis*). There is also a tendency for *sublimis* to have more consistently very high to high high nuchal crest scales. The two subspecies differ abundantly in body pattern, however, with *multistruppis* having many fine dorsal crossbands and *sublimis* having basically a blotched dorsal pattern with three bars present in some instances. The juveniles of these two subspecies are equally as distinct as the adults are in dorsal body pattern. The dewlaps are brighter in male *sublimis* than in male *multistruppis*, the latter tending toward pale yellow and yellow-grays, whereas in the former the dewlaps are yellow-orange to orange, although there is a gray basal suffusion. The ventral and throat flecking or mottling in *sublimis* differs from the unmarked condition in *multistruppis*.

*A. b. sublimis* differs from *A. b. baleatus* in having 2 (rather than 4) snout scales at the level of the second canthals, 4/4 (rather than 5/5) scales between the interparietal and supraorbital semicircles, higher means of vertical dorsal scales (19.2 versus 17.5) and ventrals (25.1 versus 23.8). Both subspecies have very high to high nuchal crest scales. In color, *baleatus* is much the brighter, with an immaculate bright yellow to orange throat and bright yellow to orange dewlap in males, whereas the dewlaps in *sublimis* are as bright as those in *baleatus* but have a gray basal wash. The patterned throat and venter in *sublimis* differ from the immaculate throat in *baleatus*. The dorsal patterns of these two subspecies likewise are quite different, that of *baleatus* regularly consisting of

three pale crossbands, whereas that of *sublimis* is mottled or blotched.

*Discussion.* *A. b. sublimis* is closest geographically to *multistruppis*; the two subspecies are known from localities separated by only 20 kilometers airline (Guaigüi and 8 km W Jarabacoa), but minimally by a 1700-foot (519 meters) difference in elevation and by extensive stands of pine forest, a habitat which no Hispaniolan giant anole occupies. All specimens of *sublimis* were collected in montane gallery forest along streams, and the subspecies appears to be restricted to this sort of situation. Rand and Williams (1969: 9) noted that they collected one juvenile about 10 feet (3 meters) up on a small branch of a forest tree at La Palma, and that two adults were brought to them by natives from a large tree in a nearby agricultural area. *A. b. sublimis* is thus not known to come into contact with *multistruppis* on the northern slopes of the Cordillera Central nor with the yet-to-be-described subspecies to the east in the Dominican lowlands. Likewise, it should be recalled that the southwestern slopes of this range are occupied by *A. r. ricordi*; the nearest localities for *ricordi* and *sublimis* (Juan de Herrera; south of El Río) are separated by about 70 kilometers airline, but this intervening area is composed of the rugged and very high massif of the Cordillera Central whose upper elevations are covered by pine. It seems unlikely that *ricordi* and *sublimis* come into contact directly across the Cordillera.

The juvenile (ASFS 33856) from near Los Montones upon which I commented in the discussion of *A. b. multistruppis* may be correctly assigned to *sublimis*, since the habitat and elevation for that specimen is much more like that for *sublimis* than *multistruppis*. In color and lack of pattern it agrees quite well with small *sublimis*, but until adults have been collected in the Los Montones region (which lies some 30 kilometers to the northwest of Jarabacoa, the closest *sublimis* locality) I am reluctant to extend the known range of *sublimis*

into that area. It is this Los Montones *A. baleatus* which is closest geographically (50 kilometers) to an *A. ricordi* locality (Los Quemados) in the northwestern portion of the República Dominicana.

*Remarks.* All ASFS *A. b. sublimis* were taken at night while asleep. All situations, as noted above, were stream-associated hardwood forest and *cafetales*, and the lizards slept on vines and branches in their customary fashion. The restriction of *sublimis* to riverine gallery forest is doubtless artificial, since it is only along rivers and streams in this area that any of the original montane hardwood forests still remain. In one case (west of Jarabacoa) the stream was extremely steep, whereas in others the streams were level. The altitudinal distribution (to which the name *sublimis* refers) is high. Only *A. r. viculus* reaches as high an elevation in the Massif de la Hotte in southwestern Haiti.

#### *Anolis baleatus caeruleolatus* new subspecies

*Holotype.* USNM 193976, an adult male, from 1.0 mi. (1.6 km) S Caño Abajo, María Trinidad Sánchez Province, República Dominicana, one of a series collected by native collectors on 28 November 1971. Original number ASFS V34486.

*Paratypes.* CM 54119-26, MCZ 125628-33, ASFS V34502-13, same data as holotype; AMNH 6017, Villa Riva, Duarte Province, República Dominicana, C. R. Halter, May-July 1915.

*Associated specimens.* REPÚBLICA DOMINICANA: *Duarte Province*, Los Bracitos (AMNH 41465-66); ca. 4 km NE Pontón (Río Cuaba) (ASFS V2987); *Sánchez Ramírez Province*, 1 km SE La Mata (ASFS V33650-51); *La Vega Province*, 12.8 km NW Bonao, 1200 feet (366 meters) (ASFS V4317); 71 km NW Santo Domingo (= near La Cumbre) (MCZ 128369); *San Cristóbal Province*, 5.0 mi. (8.0 km) NE Gonzalo, 1000 feet (305 meters) (ASFS V29420-21).

*Definition.* A subspecies of *A. baleatus* characterized by the combination of mod-

ally 4 scales between second canthal scales, 8 vertical rows of loreal scales, 3 scales between the supraorbital semicircles, 5/5 scales between the interparietal and the supraorbital semicircles, moderate number of vertical dorsal scales (14–22; mean 17.1), moderate number of ventral scales (15–32; mean 22.4), nuchal crest scales very high to high (usually) to moderate or even low (rarely) in both sexes, body crest scales extremely variable, modally moderate in both sexes, but with some occurrences of high and many occurrences of low body crest scales, subocular scales almost always separated from supralabial scales by one row of scales, both sexes some shade of green (usually dark) with four pale green crossbars and with bright sky-blue blotches along the junction of the green dorsal color and the paler venter (less prominent in females than in males), dewlap in males pale yellow to orange, in females pale yellow to orange but with much dark brown to grayish streaking or smudging, throat in males deep yellow-orange and immaculate or with very faint greenish dots, in females yellow-green to bright yellow, always with some darker green dots, rarely marbled with dark green, but never streaked with that color.

*Distribution.* Northeastern República Dominicana, from Duarte, Sánchez Ramírez, La Vega, and northern and eastern San Cristóbal provinces, to the base of the Península de Samaná (Caño Abajo); intergrades with the subspecies to the south and east in the region of El Seibo Province.

*Description of holotype.* An adult male with a snout–vent length of 137 and a tail length of 250; snout scales between second canthals 4, 7 vertical rows of loreal scales, 3 scales between the supraorbital semicircles, 6/6 scales between the interparietal and supraorbital semicircles, vertical dorsals 16, horizontal dorsals 23, ventrals 26, one row of scales between the suboculars and supralabials, fourth toe lamellae on phalanges II and III 30, nuchal crest scales very high, body crest scales moderate; in life, dorsum dark green with four pale

green crossbars, the dark green color blending quickly at the junction of the dorsal and ventral color into a series of diagonally directed sky-blue areas that give a ragged appearance to the junction of the dorsal and ventral colors; dorsal crossbands continue onto the tail; casque gray-green, eyeskin pale pea-green; dewlap pale yellow-orange, chin slightly deeper yellow-orange, throat yellow-orange, immaculate except for some vague pale greenish smudges posterolaterally.

*Variation.* The series of *A. b. caeruleolatus* consists of 20 males and 17 females. The largest male (ASFS V34505) has a snout–vent length of 148, the largest female (AMNH 6017) 145. The male is from the type locality, the female from Villa Riva. Snout scales at the level of the second canthals range between 2 and 5; the mode is 4 (14 specimens). The vertical loreal rows vary between 6 and 10; the mode is 8 (15 specimens). There are 2 or 3 scales between the supraorbital semicircles (mode 3). There are modally 5 scales between the interparietal and the supraorbital semicircles; 5 scales are involved in 52 percent of the combinations; actual counts are 4/4 (3), 4/5 (6), 5/5 (10), 5/6 (7), 6/6 (4), 6/7 (1), 4/6 (1), and 5/7 (1). Vertical dorsals range between 14 and 22 (mean 17.1), horizontal dorsals between 15 and 25 (19.9), and ventrals between 15 and 32 (22.4). Of 16 adult males, four have the nuchal crest scales very high, 11 have them high, and one has them moderate. Of 17 adult females, four have the nuchal crest scales very high, ten have them high, and three have them moderate. In the adult males, the body crest scales are high in six males, moderate in eight, and low in two, whereas in the adult females, these scales are high in five, moderate in six, and low in six. All but two lizards (6 percent) have the suboculars separated by one row of scales from the supralabials.

In a series of 12 adult male topotypes, the dorsal ground color was recorded as some shade of green (usually dark green)

with four pale pea-green crossbands. The dorsal green color blends quickly ventrolaterally into a series of irregular sky-blue patches or blotches that mark the border between the dorsal green and the pale yellow to cream venter. These sky-blue patches are often prominently extended onto the lateral margins of the venter as a series of diagonal, posteriorly directed areas, which, upon preservation, are still prominent features of the lower sides. The upper surface of the head was gray-green to brown, the eyeskin pale pea-green. The dorsal banded pattern of dark and light green continues onto the tail. The dewlap is pale yellow-orange, yellow, or orange, and the chin is slightly deeper yellow-orange, concolor with the throat, which is either immaculate (usually) or with very faint greenish dots or smudges. Eleven female topotypes were colored and patterned dorsally like the males, with the pattern extending onto the tail, but there is only a vague indication of the ventrolateral sky-blue pigmentation. The necks of females were often streaked with dark and pale greens. The chin and throat were yellow to yellow-green, regularly with some darker green dots, blotches, or occasionally marbled with dark green. The female dewlap was yellow to pale orange, streaked with dark brown or grayish.

Two females from the *haitises* region near Gonzalo were deep to emerald green in life with yellow dewlaps having varying amounts of brown streaking or smudging; the limbs were contrastingly banded dark and pale green. The throats were bright yellow to bright green, with scattered deeper green spots in each case. In a pair from La Mata, the dorsa were bright green, somewhat marbled with yellow and yellow-green, the upper surfaces of the heads were pale fawn, the eyeskin pale grayish green, and the dewlaps orange in both sexes.

The series of *A. b. caeruleolatus* includes four juveniles and subadults with snout-vent lengths from 60 to 91; the largest of these is a topotype that was colored and

patterned like adults except that the sky-blue lower edges to the dorsal color were absent and the dewlap was streaked brown and gray basally. The chin and throat were immaculate pale green. There are no color data on the other juveniles, and none of them presently shows any pattern.

*Comparisons.* *A. b. caeruleolatus* differs from all previously described subspecies in having the sky-blue patching along the lower sides. In having four dorsal pale green body bands, *caeruleolatus* differs strikingly from *multistruppis* with its multiple banding; in addition, the dewlap of *multistruppis* is pale and often grayish, in contrast to the generally brighter dewlaps of *caeruleolatus*. From nominate *baleatus*, *caeruleolatus* differs in having the throat yellow to yellow-green rather than bright yellow to orange, and female *caeruleolatus* have the throat with dark green markings. From high upland *sublimis*, *caeruleolatus* differs in having the sky-blue blotches ventrolaterally and in lacking ventral markings, and whereas *caeruleolatus* has comparably pigmented dewlaps, those in *sublimis* are generally paler and often suffused at least basally with gray. The dorsal patterns of both *sublimis* and *caeruleolatus* are comparable, since both are crossbanded.

As far as meristic counts are concerned, *caeruleolatus* differs from the named subspecies in the following ways. Compared with *baleatus*, *caeruleolatus* has modally 8 (rather than 7) vertical loreal rows, and a lower mean number of ventral scales (22.4 versus 23.8). There is also a strong tendency for adult *caeruleolatus* to have moderate to low body crest scales, whereas in *baleatus* the tendency is toward high to moderate body crest scales. Compared with *multistruppis*, *caeruleolatus* has modally 4 (rather than 2) snout scales at the level of the second canthals, 8 rather than 7 vertical rows of loreals, 5/5 rather than 4/4 scales between the interparietal and the supraorbital semicircles, and a lower mean of vertical dorsal scales (17.1 versus 18.6). With regard to body crest scales,



these two subspecies show the same situation as *caeruleolatus* and *baleatus*. Compared with *sublimis*, *caeruleolatus* has 4 (rather than 2) snout scales at the level of the second canthals, 8 (rather than 7) vertical rows of loreals, 5/5 (rather than 4/4) scales between the interparietal and the supraorbital semicircles, and lower means of both vertical dorsals (17.1 versus 19.2) and ventrals (22.4 versus 25.1). *A. b. sublimis* has not been recorded as having the dorsal body crest scales other than high, in contrast to the strong tendency in *caeruleolatus* of having these scales moderate to low.

*Discussion.* *A. b. caeruleolatus* centers in the extremely mesic eastern portion of the Valle de Cibao in that area that has the most rainfall in the República Dominicana. I have already commented on the specimens from Los Bracitos, Duarte Province; these specimens are old and patternless and are from a locality in the Cordillera Septentrional which is, farther west, occupied by *A. b. baleatus*; I include them with *caeruleolatus* provisionally. The specimen from Pontón, Duarte Province, is a juvenile (ASFS V2987; snout-vent 60) and is presently patternless; no color data are available. It too I only provisionally regard as *caeruleolatus*. The two specimens from La Vega Province (ASFS V4317, MCZ 128379) are also without color data in life, and the former is a patternless juvenile (snout-vent 69). Specimens from these last two localities also require verification as to subspecific status.

*A. b. caeruleolatus* presumably intergrades with four subspecies: *baleatus*, *multistruppus*, the subspecies on the Península de Samaná, and subspecies to the southeast. Only in the last case are specimens that I interpret as intergradient known, and they will be discussed under the description of the southeastern subspecies. No intergrades are known between the Samaná subspecies, *baleatus*, or *multistruppus*. Distance between *caeruleolatus* and the nearest localities for these subspecies are: Samaná subspecies—13 kilometers

(Caño Abajo and 5 km NW Sánchez); *baleatus*—50 kilometers (Los Bracitos and Pena); *multistruppus*—12 kilometers (12.8 km NW Bonao and Guagüí). Of these presumed areas of contact, that between *caeruleolatus* and the Samaná subspecies is not unexpected; the area between the two known localities is very open and relatively barren and devoid of trees and appears always to have been so. There are fine high swamp-forests in the western part of this intervening region, and it is possible that intergrades between these two distinctive subspecies will be encountered in these forests. Most puzzling is the absence of intergradation between *caeruleolatus* and *multistruppus*. The specimen from northwest of Bonao is a juvenile, but it does not show the characteristic multiple crossbands of both young and adult *multistruppus*. It may be that *multistruppus* occupies only the foothills of the Cordillera Central and that the zone of intergradation between *multistruppus* and *caeruleolatus* is very abrupt.

*Remarks.* *A. b. caeruleolatus* is known from sea level to an elevation of 1000 feet (305 meters) in the *haitises* region near Gonzalo and 1200 feet (366 meters) northwest of Bonao. Specimens were secured primarily from native collectors; the long series of topotypes is due to the industry of the inhabitants of Caño Abajo. The Caño Abajo area is one of *cafetales* and *cacaotales* with high canopied shade-trees, and the lizards apparently are extremely abundant in this optimal habitat. The pair of lizards from La Mata were secured by me while they were copulating on the side of a large shade-tree in a *cafetal* about 4 feet (1.2 meters) above the ground at 1225 hours. The two females from Gonzalo were taken during the day on large trees adjacent to a small spring in the *haitises*; the surrounding area was under heavy cultivation, but the doline slopes were covered locally with undisturbed forest.

The name *caeruleolatus* is from the Latin "caeruleus" for "blue" and "latus"

for "side," in allusion to the sky-blue lower sides of this subspecies.

*Anolis baleatus samanae*  
new subspecies

*Holotype*. CM 54105, an adult male, from 7.6 mi. (12.2 km) NE Sánchez, 1000 feet (305 meters), Samaná Province, República Dominicana, one of a series collected by native collectors on 28 November 1971. Original number ASFS V34474.

*Paratypes*. ASFS V34475-79, same data as holotype; USNM 193990-92, same locality as holotype, native collectors, 27 November 1971; MCZ 125634, 5.0 mi. (8.0 km) NW Sánchez Province, República Dominicana, J. Aria, 27 November 1971; ASFS V34495-96, 5.0 mi. (8.0 km) NW Sánchez, Samaná Province, República Dominicana, J. Aria, 28 November 1971; CM 54127-30, 5.0 mi. (8.0 km) NW Sánchez, Samaná Province, República Dominicana, J. Aria, 30 November 1971; MCZ 125635-39, USNM 193993-4001, 5.0 mi. (8.0 km) NW Sánchez, Samaná Province, República Dominicana, J. Aria, 1 December 1971; ASFS V34514, ASFS V34836-38, Las Terrenas, Samaná Province, República Dominicana, native collector, 28 November 1971; ASFS V1904, 6 km E Sánchez, Samaná Province, República Dominicana, R. Thomas, 30 October 1963; AMNH 28651, Samaná, Samaná Province, República Dominicana, J. King, August 1924; AMNH 39817-23, AMNH 42285, Laguna, Samaná Province, República Dominicana, W. G. Hassler, October-December 1929; USNM 61928, Cayo Hondo, Samaná Province, República Dominicana, W. L. Abbott, February 1919.

*Definition*. A subspecies of *A. baleatus* characterized by the combination of modally 2 snout scales at level of second canthal scales, 7 vertical rows of loreal scales, 3 scales between the interorbital semicircles, 4/4 scales between the interparietal and the supraorbital semicircles, moderate number of vertical dorsal scales (13-20; mean 16.6), moderate number of ventral scales (16-29; mean 22.1), nuchal crest scales very high to high (usually) to mod-

erate or low (rarely) in both sexes, body crest scales high to moderate but often low in both sexes, subocular scales almost always separated from supralabial scales by one (rarely 2) row of scales; dorsum in both sexes in life blotched dark green, greenish, dull gray-green, brown, or blackish, dewlaps in males dull yellow to pale yellowish orange, in females very pale yellow to pale yellowish orange, streaked with blackish or brown basally, and chin and throat in males cream to yellowish or yellow-orange, mottled with black or gray, in females pale green to greenish yellow with dark green to brown streaking or even reticulate.

*Distribution*. The Península de Samaná in the northeastern República Dominicana, and apparently islets in the Bahía de Samaná.

*Description of holotype*. An adult male with a snout-vent length of 145 and a tail length of 222 (regenerated); snout scales between second canthals 3, 6 vertical rows of loreal scales, 3 scales between the supraorbital semicircles, 4/4 scales between the interparietal and the supraorbital semicircles, vertical dorsals 18, horizontal dorsals 19, ventrals 21, one row of scales between the suboculars and supralabials, fourth toe lamellae on phalanges II and III 30, nuchal crest scales very high, body crest scales high; in life, dorsum mottled dull greens and gray-brown with whitish (almost cream but suffused with pale gray); upper surface of head mixed dark brown and gray, venter dull greenish, dewlap orange, chin and throat creamy to yellowish, not marked with green.

*Variation*. The series of 54 *A. b. samanae* consists of 32 males and 22 females. The largest male (AMNH 39807) has a snout-vent length of 157; the largest females (CM 54130, USNM 193994) have snout-vent lengths of 145. The male is from Laguna, the females from 5.0 mi. NW Sánchez. Snout scales at the level of the second canthals range between 2 and 5; the mode is 2 (24 specimens). The vertical loreal rows vary between 5 and 9; the

mode is 7 (25 specimens). There are 2 or 3 scales between the supraorbital semicircles (mode 3). There are modally 4 scales between the interparietal and the supraorbital semicircles; 4 scales are involved in 43 percent of the combinations: actual counts are 3/3 (2), 3/4 (3), 4/4 (17), 4/5 (8), 5/5 (13), 5/6 (5), 6/6 (1), 6/7 (2), 4/6 (1), and 3/5 (1). Vertical dorsals range between 13 and 20 (mean 16.6), horizontal dorsals between 13 and 27 (19.3), and ventrals 16–29 (22.1). Of 30 adult males, 14 have the nuchal crest scales very high, 15 have them high, and one has them moderate; in 20 adult females, nine have the nuchal crest scales very high, nine have them high, one has them moderate, and one has them low. Body crest scales in males are high in three lizards, moderate in 16, and low in ten; in females, 11 have these scales moderate and ten have them low. The suboculars are separated from the supralabials by one row of scales in all but four specimens (7 percent), which have them in contact, and one specimen (2 percent), which has 2 rows of scales in this position.

*A. b. samanae* is basically a blotched lizard, and no adults show any indication of crossbanding. The body is irregularly blotched with blackish, dark green, dull green, gray-brown, and occasionally there are sky-blue areas along the ventrolateral margin of the dorsal coloration in males, but these areas are not so prominent as in *caeruleolatus*. Regardless of the dorsal shades, the upper surface of the head is mixed dark brown and shades of gray in both sexes. The hindlimbs are finely barred with pale and dark green. The venter is dull greenish in both sexes. The dewlap in males varies from dull yellow or pale yellowish orange to orange, and the chin and throat are yellowish, cream, or yellow-orange, mottled with black or gray. In females, the dewlaps are very pale yellow, pale yellow-orange, or grayish orange, at times streaked with blackish or brown basally, and the chin and throat ground color is pale green, marbled, streaked, or

even reticulate with dark green to (rarely) brown.

There are one juvenile (AMNH 28651; snout-vent length 40) and two subadult (snout-vent lengths 92 and 97) *A. b. samanae*. The subadults are old and discolored but their patterns seem not to differ from those of full adults. The juvenile on the other hand, has four bold pale crossbars on the dorsum, the pattern continuing onto the tail. This young individual has the umbilicus still present and is presumably near hatchling size.

*Comparisons.* Since *samanae* and *caeruleolatus* are adjacent geographically, the most pertinent comparisons are between them. Examples of these two populations, as noted in the introduction to the present paper, were available to me simultaneously and I was struck with their differences in life. *A. b. samanae* is a blotched lizard whereas *caeruleolatus* is a crossbanded one; the latter subspecies also typically has sky-blue ventrolateral blotches, a feature absent (or occasionally poorly expressed) in male *samanae*. Male dewlap colors are similar in both subspecies, although female dewlap colors in *samanae* seem somewhat paler than those of *caeruleolatus*. The chin and throat markings of the two subspecies are quite distinct; in male *caeruleolatus*, the throat is deep yellow to yellow-orange, at best with very faint grayish dots or smudges, whereas in male *samanae* the throat is yellowish or cream to yellow-orange, mottled with black or gray. In female *caeruleolatus*, the throat is yellow to yellow-green, always with some dark green dots, blotching, or marbling, whereas in *samanae* females, the throat is pale green, greenish yellow, or yellow-green, with dark green to brown streaking or reticulum.

The only subspecies thus far described which is blotched like *samanae* is the Cordillera Central *sublimis*, although *caeruleolatus* may show a marbled dorsum in some areas. No pigmental or pattern differences separate *samanae* and *sublimis*, since in both dorsal coloration and color of

the dewlap the major color involved is green. However, the throat in male *sublimis* is pale green, whereas in *samanae* it is cream to yellow-orange. Certainly *multi-truppus* and *samanae* are easily distinguished in the field by their very different dorsal patterns, for example, and *baleatus*, with its very, very bright chin and throat, both of which are immaculate, is quite distinctive from *samanae*.

In meristic data, *samanae* differs from *caeruleolatus* in having 2 (rather than 4) snout scales, 7 (rather than 8) vertical rows of loreals, and 4/4 (rather than 5/5) scales between the interparietal and the supraorbital semicircles. From *multi-truppus*, *samanae* differs in having a lower mean of vertical dorsal scales (16.6 versus 18.6), and the same difference occurs between *samanae* and *sublimis* (16.6 versus 19.2) and in ventrals (22.1 versus 25.1). From *baleatus*, *samanae* differs in having 2 (rather than 4) snout scales, 4/4 (rather than 5/5) scales between the interparietal and the supraorbital semicircles, and lower means in both vertical dorsals (16.6 versus 17.5) and ventrals (22.1 versus 23.8). The nuchal crest scales in *samanae* are more consistently very high to high than they are in any of the other subspecies of *A. baleatus*.

*Discussion.* As pointed out in the discussion of *A. b. caeruleolatus*, there are no intergrades known between that subspecies and *samanae*. The isthmus of the Península de Samaná is much cleared and locally even barren, but there are large western swampy areas that support magnificent hardwood forests toward the landward side. These forests may well support intermediates between *samanae* and *caeruleolatus*, or, because of their proximity to the mainland, they may be inhabited by *caeruleolatus*. Specimens from 5.0 mi. NW Sánchez, that locality for *samanae* which is closest to a known locality for *caeruleolatus* (18 kilometers), show no tendencies toward the crossbanded condition of *caeruleolatus*.

*A. b. samanae* is the only Hispaniolan giant anole known by specimens from any off-shore island or islet. The specimen from Cayo Hondo, taken by W. L. Abbott, constitutes this record, although I am unable to locate this islet. I assume it is one of the archipelago within the Bahía de Samaná.

*Remarks.* All but one *A. b. samanae* secured by myself and parties were native-collected. The exception is a lizard taken by Richard Thomas, one of two seen on a small tree and in a vine tangle in a steep limestone ravine east of Sánchez. The area of the type locality is in the uplands of the Sierra de Samaná on the road between Sánchez and Las Terrenas. Thus newly constructed road passes through superb mesic high-canopied forest, and much of the area is not yet seriously disturbed. Obviously from the number of lizards secured by natives in this region, *A. b. samanae* is common. The range is not high, with a maximum elevation of 1673 feet (510 meters) in Monte Las Cañitas; this mountain lies between Sánchez and Las Terrenas. Specimens from Las Terrenas itself were secured by natives from near-coastal mesic *cafetales* and *cacaotales*, and lizards from northwest of Sánchez were in similar situations.

Only three other reptiles (*Diploglossus sternurus alloeides* Schwartz, *Leiocephalus personatus pyrrholaemus* Schwartz, and *Dromicus parvifrons niger* Dunn) are known to have differentiated at the subspecific level on the Península de Samaná. *Sphaerodactylus clenckii* Shreve and *Sphaerodactylus samanensis* Cochran both occur there and have as yet unnamed populations, one of which in each case is limited to the peninsula. It is also of interest to note that in *Anolis distichus* Cope, the Samaná population is identical to the population on the southern shores of the Bahía de Samaná (*ignigularis* Mertens), but that the range of this subspecies is interrupted at the head of the Bahía de Samaná by *A. d. dominicensis* Reinhardt and Lütken (see Schwartz, 1968: 280-81, for details).

*Anolis baleatus litorisilva* new subspecies

*Holotype.* USNM 193977, an adult male, from 1.2 km SSW Punta Cana, La Altagracia Province, República Dominicana, one of a series collected by Danny C. Fowler and Bruce R. Sheplan, on 24 November 1971. Original number ASFS V35095.

*Paratypes.* ASFS V35096–100, same data as holotype; CM 54113–14, MCZ 125616–17, 5.5 km SSW Punta Cana, La Altagracia Province, República Dominicana, D. C. Fowler, 27 November 1971; ASFS V29090, Juanillo, La Altagracia Province, República Dominicana, native collector, 24 July 1971; ASFS V961–62, 0.5 mi. NW Boca de Yuma, La Altagracia Province, República Dominicana, R. F. Klinikowski, R. Thomas, 2 September 1963; ASFS V1136, 2.5 km NW Boca de Yuma, La Altagracia Province, República Dominicana, native collector, 4 September 1963; ASFS V17573, 4 km NW Boca de Yuma, La Altagracia Province, República Dominicana, A. Schwartz, 13 June 1969; ASFS V17616, 2 km NW Boca de Yuma, La Altagracia Province, República Dominicana, J. B. Strong, 15 June 1969.

*Definition.* A subspecies of *A. baleatus* characterized by the combination of 2 or 4 characters at level of the second canthal scales, 7 vertical rows of loreal scales, 3 scales between the interorbital semicircles, 4/5 scales between the interparietal and the supraorbital semicircles, low number of vertical dorsals (13–19; mean 15.9), low number of ventral scales (18–26; mean 21.3), nuchal crest scales always very high to high in both sexes, body crest scales high (rarely) to moderate or low, subocular scales usually separated from supralabial scales by one row of scales; dorsum in life varying from light blue-brown to light greenish brown in males, dull brown to olive-brown in females, blotched with creamy to gray, dewlap in males bright orange, brownish in females, and chin and throat (including lips) bright orange in males, pale yellow-green in females.

*Distribution.* Extreme eastern República Dominicana in La Altagracia Province, from Punta Cana to the vicinity of Boca de Yuma.

*Description of holotype.* An adult male with a snout–vent length of 136 and a tail length of 183 (regenerated); snout scales between second canthals 2; 6 vertical rows of loreal scales, 3 scales between the supraorbital semicircles, 5/5 scales between the interparietal and the supraorbital semicircles, vertical dorsals 15, horizontal dorsals 16, ventrals 25, subocular scales in contact with the supralabial scales, fourth toe lamellae on phalanges II and III 31, nuchal crest scales very high, dorsal body crest scales high; in life, dorsum blotched light blue-brown and light green-brown; venter pale gray-green; chin, lips, and dewlap bright orange.

*Variation.* The series of 16 *A. b. litorisilva* is composed of six males and ten females. The largest male (MCZ 125616) has a snout–vent length of 158, the largest female (ASFS V961) 131. The male is from 5.5 km SSW Punta Cana, the female from 0.5 mi. NW Boca de Yuma. Snout scales at the level of the second canthals range between 2 and 5; there are two modes, 2 and 4, each with five individuals. The vertical loreal rows vary between 6 and 9; the mode is 7 (nine specimens). There are 2 to 4 scales between the supraorbital semicircles (mode 3). There are modally 4/5 scales between the interparietal and the supraorbital semicircles; 5 scales are involved with 59 percent of the combinations; actual counts are 4/4 (4), 4/5 (6), 5/5 (5), and 5/6 (1). Vertical dorsals range between 13 and 19 (mean 15.9), horizontal dorsals between 14 and 22 (18.5), and ventrals between 18 and 26 (21.3). Of four adult males, three have the nuchal crest scales very high and one has them high; of five adult females, two have these scales very high and three have them high. In the males, the body crest scales are high in one and moderate in three, and in the females, these scales are

moderate in two and low in three. The suboculars are separated from the supralabials by one row of scales in all but one specimen (6 percent).

*A. b. litorisilva* is essentially a blotched lizard whose colors do not include bright or even medium greens. The color notes on the holotype apply equally well to the other adult males—the dorsum is blotched with bluish browns and light greenish browns, without any clear greens, and the blotching is often more pronounced on the head than on the body. In females, the dorsum is dull brown to olive-brown with only occasional slight remnants of a lighter green pattern on the head; the blotching in the female involves creamy to gray pigmentation. The venter is pale gray-green or whitish green in males, pale greenish gray in females. The dewlap in all adult males was recorded as bright orange, and brownish in females. In males, the chin (including the lips) is bright orange, and pale yellow-green in females. The upper surface of the head in males is blotched like the body and is dark chocolate in females. In females, the upper surfaces of the hindlimbs were recorded as olive-brown, blotched with cream to gray like the dorsum.

The series of *A. b. litorisilva* contains seven juveniles and subadults (snout-vent lengths 45 to 88). The smallest juvenile (ASFS V17573, female) was bright green in life with four pale buffy crossbands and dark green shadow-bars between the crossbands; the tail was ringed cream and dark gray, and the venter was pale green. The dewlap was yellow-green and gray. A slightly larger female (ASFS V17616) with a snout-vent length of 57 was yellow-green dorsally and without bands, the head was brown; the eyeskin was green, and the venter yellow-green. The tail was banded black and yellow-green, and the dewlap was mainly brown with the scale rows yellow-green. A still larger female (ASFS V1136) with a snout-vent length of 67 was green, faintly crossbarred with grayish green, and there were charcoal smudges on

the neck. Two male subadults with snout-vent lengths of 71 and 83 (ASFS V35099–100) from the type locality were recorded by Fowler as follows: "One with a strong vertical banding pattern alternating brown-green and white-gray, which extends from tip of tail to the head where it becomes slightly more diffuse; on the other, the dorsal ground color is dull brown with remnants of banding pattern only around head; the ventral ground color of the first is gray-green with brown mottling, the second is dull gray-brown; in both juveniles, the dewlap is orange-green and the chin and lips are green." The largest subadult (ASFS V29090) was patternless green above, and the dewlap was orange with charcoal stripes; the specimen is a female.

*Comparisons.* Because of its blotched (rather than crossbanded) pattern, *litorisilva* requires comparison with *samanae* and *sublimis*. The general effect of the dorsa of all three subspecies is quite similar, but *samanae* and *sublimis* are much the brighter lizards, with greens predominant in the dorsal pigmentation. On the other hand, *litorisilva* is a much more drab lizard, without clear greens in the adults, the tendency being toward more sombre hues, primarily shades of browns. From all other described subspecies, *litorisilva* differs in being blotched rather than crossbanded and also in having much less gaudy dorsal colors. In meristic counts, *litorisilva* differs from the remaining subspecies in the following ways. From *caeruleolatus*, *litorisilva* differs in having 7 (rather than 8) vertical loreal rows, and lower means of vertical dorsals (15.9 versus 17.1) and ventrals (21.3 versus 22.4). From *multistruppis*, *litorisilva* differs in lower means of vertical dorsals (15.9 versus 18.6) and ventrals (21.3 and 22.3). From *sublimis*, *litorisilva* differs in having lower means of vertical dorsals (15.9 versus 19.2) and ventrals (21.3 versus 25.1). From *baleatus*, *litorisilva* differs in having lower means of vertical dorsals (15.9 versus 17.5) and ventrals (21.3 versus 23.8). Meaningful comparisons of *litorisilva* with

other subspecies in counts of snout scales, and scales between the interparietal and the supraorbital semicircles, are impossible since *litorisilva* has a bimodal condition in the former (and the bimodes are 2 and 4, those counts which occur singly as the mode in the other subspecies) and has a mode of 4/5 in the latter (whereas all other species have either 4/4 or 5/5). Considering the fairly large series of *litorisilva* (16 specimens), these two "abnormal" conditions are puzzling. At least in the case of 4/5 counts, the absence of 3/3 or 3/4 counts in *litorisilva* suggests that this subspecies tends toward a 5/5 count.

*Discussion.* *A. b. litorisilva* appears to be the extreme eastern isolate of the more widespread *A. baleatus* stock. It occupies semi-arid forests on and near the coast (as at Juanillo and Punta Cana) and on the limestone ridge behind Boca de Yuma. Both situations are far more xeric than is customary for *A. baleatus*, and the faded nongreen coloration of the adults is doubtless a response to the dry and open to dense forest conditions of this region. Nevertheless, individuals are quite conspicuous at night as they sleep exposed. *A. b. litorisilva* presumably comes into contact with the subspecies to the north and west (named below) but intergrades are presently unknown; in the vicinity of Higüey (the closest locality for the adjacent subspecies) the lizards are more brightly colored and crossbanded and quite unlike *litorisilva*.

*Remarks.* All but one specimen of *litorisilva* were collected by myself and parties. Individuals were found sleeping in primarily coastal forest (to which the name, from "litus" for "shore" and "silva" for "forest," refers in Latin) at elevations from 4 to 15 feet (1.2 to 4.6 meters) above the ground. Generally, juveniles sleep closer to the ground and in more dense situations than adults. One juvenile was taken from a roadside *Acacia*, a most unusual situation (since *Acacia* is a distinct xerophyte) for any giant anole. Several adults were taken in dense viny tangles,

sleeping on the woody vines; the advantage of this situation was made quite obvious when I attempted to catch a large adult at night by hand. The light from my flashlight awakened the lizard almost immediately, and although I was extremely careful not to jar any of the vines, this was a vain endeavor. At the first jostling, the lizard jumped to the ground and escaped in the dry leaf litter and understory.

#### *Anolis baleatus scelestus* new subspecies

*Holotype.* CM 54106, an adult male, from 5.1 mi. (8.2 km) E Santo Domingo (from Río Ozama), Distrito Nacional, República Dominicana, one of three collected by David C. Leber and Richard Thomas on 18 June 1964. Original number ASFS V2460.

*Paratypes.* ASFS V2461-62, same data as holotype; MCZ 125618-27, 8.4 mi. (13.4 km) NE La Romana, 100 feet (31 meters), La Romana Province, República Dominicana, B. R. Sheplan, 22 November 1971; CM 54115-18, USNM 193981-89, 8.4 mi. (13.4 km) NE La Romana, 100 feet (31 meters), La Romana Province, República Dominicana, D. C. Fowler, A. Schwartz, 17 July 1971; MCZ 16321, La Romana, La Romana Province, República Dominicana, E. Leider, 1922; ASFS V29284-300, 0.2 mi. (0.3 km) N Otra Banda, 350 feet (107 meters), La Altagracia Province, República Dominicana, D. C. Fowler, A. Schwartz, 26 July 1971; ASFS V21699-700, 1 km NE Higüey, La Altagracia Province, República Dominicana, J. R. Dennis, R. Thomas, 16 August 1969; USNM 193979-80, 0.7 mi. (1.1 km) W Higüey, La Altagracia Province, República Dominicana, R. Thomas, 29 August 1963; ASFS V1038, 1 mi. (1.6 km) W Higüey, La Altagracia Province, República Dominicana, R. Thomas, 3 September 1963; ASFS V28757, 15.5 mi. (24.8 km) E San Pedro de Macorís, Río Cumayasa, La Romana Province, D. C. Fowler, 12 July 1971; ASFS V28910-16, 15.5 mi. (24.8 km) E San Pedro de Macorís, Río Cumayasa, San Pedro de Macorís Province, República Dominicana, D. C. Fowler, A.

Schwartz, 16 July 1971; ASFS V28847, 15.5 mi. (24.8 km) E San Pedro de Macorís, La Romana Province, República Dominicana, A. Schwartz, 15 July 1971.

*Associated specimens.* REPÚBLICA DOMINICANA: *La Altagracia Province*, 1 km SE Las Lisas (ASFS V17434-35); *San Cristóbal Province*, 8 km N Yamasá, 200 feet (61 meters) (ASFS V28656).

*Definition.* A subspecies of *A. baleatus* characterized by the combination of modally 2 scales at level of the second canthal scales, 7 vertical rows of loreal scales, 3 scales between the supraorbital semicircles, 5/5 scales between the interparietal and the supraorbital semicircles, low number of vertical dorsals (12–20; mean 15.4), low number of ventral scales (17–28; mean 21.1), nuchal and body crest scales always very high to high in both sexes, subocular scales usually separated from supralabial scales by one (occasionally two) row of scales; dorsum in both sexes either green with three pastel green crossbands or dark green flecked with light green, cream with some greenish to brownish green smudges, dewlap in males deep yellow to deep orange, streaked or smudged with dark brown to charcoal, and throat in females dark green marbled with yellow and pale green (males unrecorded).

*Distribution.* Southeastern República Dominicana, from the Sierra de Yamasá and the vicinity of Santo Domingo in the west, east to the region about Higüey and Las Lisas in La Altagracia Province.

*Description of holotype.* An adult male with a snout–vent length of 152 and a tail length of 267; snout scales between second canthals 4; 8 vertical rows of loreal scales, 2 scales between the supraorbital semicircles, 4/5 scales between interparietal and supraorbital semicircles, vertical dorsals 16, horizontal dorsals 16, ventrals 22, subocular scales separated from supralabial scales by one row of scales, fourth toe lamellae on phalanges II and III 34, nuchal crest scales high, body crest scales moderate; in life, dorsum olive-green with six

pastel green crossbands, tail and venter light green; dewlap dark yellow.

*Variation.* The series of 61 *A. b. scelestus* consists of 27 males and 34 females; a large number of the specimens are juveniles and subadults. The largest male (ASFS V29284) has a snout–vent length of 180, the largest female (ASFS V29286) 147; both are from near Otra Banda. Snout scales at the level of the second canthals range between 2 and 4; the mode is 2 (32 specimens). The vertical loreal rows vary between 5 and 8, with a mode of 7 (25 specimens). There are 1 to 4 scales between the supraorbital semicircles (mode 3). There are modally 5/5 scales between the interparietal and the supraorbital semicircles; 5 scales are involved in 49 percent of the combinations; actual counts are 3/4 (2), 4/4 (14), 4/5 (14), 5/5 (17), 5/6 (11), 6/6 (1) and 4/6 (1). Vertical dorsals range between 12 and 20 (mean 15.4), horizontal dorsals between 15 and 25 (18.8), and ventrals between 17 and 28 (21.1). Of 11 adult males, nine have the nuchal crest scales very high and two have them high. Of 16 adult females, nine have these scales very high and seven have them high. Body crest scales in males are high in two lizards, moderate in eight, and low in three; in females, the body crest scales are high in two, moderate in eight, and low in six. Fifty-three specimens have the suboculars separated from the supralabials by one row of scales, whereas in four lizards (7 percent) these scales are in contact, and in two lizards (3 percent) they are separated by two rows of scales.

In general, both sexes of *A. b. scelestus* show a pattern of about six or seven fine crossbands that are often obscured by dorsal blotching. Colors are shades of greens, with brighter green the base color and the blotching tending toward darker shades. The crossbands are lighter pastel shades of green, and in some lizards the dorsal ground color is olivaceous. Another variant, which is somewhat more prevalent in females, is an olive green to dark green



dorsum, flecked with pale green. Two females from near Higüey showed still another style of body pattern and color, with the dorsal ground color cream with some dark green to brownish green smudges, and the neck with alternating pale blue and charcoal markings, the pale blue markings persisting onto the cheeks. In males the upper surface of the head is brown, and in females it is mixed brown and green, with the snout and supraocular scales deep green in some lizards. In females, the chin and throat are dark green, marbled with yellow and pale green. The dewlap is rather variable; in males it has been recorded as dark yellow or deep yellow to orange or dark orange, whereas in females the dewlap varies from yellow to dark orange with dark brown, olivaceous, or charcoal streaking, marbling, or smudging. Although there are no color notes in life, in the preserved lizards the eyeskin is regularly pale gray, and I presume that in life the eyeskin is set off from the rest of the head color in some pigmental fashion. Many specimens of both sexes have the lower sides tigroid with "stripes" extending conspicuously onto the lateral sides of the abdomen.

There are 34 juvenile and subadult *A. b. scelestus*, with snout-vent lengths between 46 (USNM 193989) and 94 (ASFS V21699-700). Three juveniles (snout-vent lengths 46-61) have umbilici still present. This entire suite of young lizards shows a remarkable diversity in dorsal pattern. Even small specimens may be either unicolor green (usually with a vertical nuchal white crescent and a white subocular spot), green with three or four yellow body bands, or there may be many more bands resulting from the interposition of pale body bands between the primary pale body bands. One specimen (ASFS V29296; snout-vent length 70, male) has both pale body bands and interstitial pale blotching, whereas another lizard (MCZ 125621; snout-vent length 86, female) already shows the adult pattern of several fine pale

crossbands on a green ground. The largest subadults, however, (ASFS V21699-700; snout-vent lengths 94, male and female) are both presently unicolor and show no indications of the adult body banding. That a single juvenile may demonstrate a pattern change is shown by the following notes on ASFS V28757, a female with a snout-vent length of 54: "Alive, emerald green with about four pale yellow crossbands on body; dead—seven narrow brown body bands which are hollowed, and the dorsal ground color now pale yellow-green." The dewlap in young males is orange, in young females from dull yellow streaked with charcoal to charcoal.

*Comparisons.* In color and pattern, *A. b. scelestus* differs from all other subspecies. No other named population has six or seven narrow dorsal crossbands; even *multistruppis* is much more conspicuously banded than *scelestus* and lacks any sort of dorsal blotching. *A. b. scelestus* is known to intergrade with more northern *caeruleolatus* and is presumed to meet *litorisilva*. In each case, there is no difficulty distinguishing the adjacent forms chromatically. *A. b. caeruleolatus* typically has (in males) sky-blue blotches along the junction of the dorsal and ventral colors, and is prominently crossbanded with three dorsal crossbands. *A. b. litorisilva* is a blotched lizard, the dorsal colors much more drab than those of *scelestus*, tending toward browns and brownish greens. Perhaps *scelestus* most closely resembles *multistruppis*, but, although both are banded, the bands in *multistruppis* are much finer and much more numerous than the six or seven pale dorsal crossbars in *scelestus*.

*A. b. scelestus*, with modally 2 snout scales, differs from *caeruleolatus*, which has 4 snout scales. In having 7 vertical loreal rows, *scelestus* differs from *caeruleolatus*, which has 8 rows. In having 5/5 scales between the interparietal and supraorbital semicircles, *scelestus* differs from *samanae*, *multistruppis*, and *sublimis*, all of which have 4/4. *A. b. scelestus* has the lowest

mean of vertical dorsals (15.4) of all named subspecies, being most closely approached by *litorisilva* (15.9). *A. b. scelestus* males are larger than those of any other subspecies (180 in *scelestus*, 158 in *litorisilva*, which is second largest) and in fact this subspecies exceeds all other Hispaniolan giant anoles in size, being most closely approached by male *A. r. ricordi*, which reach a snout-vent length of 160.

*Discussion.* I am uncertain that all specimens included in *scelestus* should be so associated. This is especially true of the specimen from near Yamasá (ASFS V28656); this is a juvenile male and its taxonomic status remains somewhat in doubt, since it is young. It is also possible that specimens from Santo Domingo likewise are not identical with more eastern lizards, although the two samples agree fairly well.

*A. b. scelestus* and *A. b. caeruleolatus* intergrade in the region of El Seibo Province; I have examined the following material from El Seibo which I consider intergradient: 3.5 mi. (5.6 km) S Sabana de la Mar (ASFS X7877); 2.1 mi. (3.4 km) N El Valle (ASFS X7861-62); 3 km N El Valle (ASFS V3157-58); 10.5 km N Hato Mayor (ASFS V35329-30). This series consists of three juveniles and four young adults (with snout-vent lengths between 112 and 127). The single adult male (ASFS X7877) was tannish gray in life with darker brown blotches, a pale green venter, and an orange dewlap. Two adult females (ASFS X7861-62) were pale pea-green with vertical gray bars, the upper surface of the head grayish tan, venter green, and dewlap grayish orange. The lower jaw and throat were green mottled with darker green. In general this series seems closer to *caeruleolatus* than to *scelestus*, but the male lacks sky-blue ventrolateral markings. On the other hand, the vertical gray bars, recorded for the female, resemble the pattern of *scelestus* rather than that of female *caeruleolatus*. It seems likely that *caeruleolatus* and *scelestus* intergrade in this region.

*Remarks.* Almost all ASFS *scelestus* were secured while the lizards were asleep at night. Typical situations are lowland *cacaotales* and *cafetales* with their high canopied shade-trees, along lowland streams (as at Otra Banda and Yamasá), and in woods associated with limestone cliffs (east of Santo Domingo). The long series from the Río Cumayasa is from the high riverine woods along that stream; remarkably, we secured only juveniles and subadults at this locality, despite three nocturnal visits. One juvenile from this locality was taken on the exposed branch of an *Acacia* tree along an open road. Perhaps the most remarkable place whence *A. b. scelestus* has been taken is the locality northeast of La Romana. This place is a deep and well-wooded ravine through which flows a clear stream; however, the ravine is completely surrounded on all sides by cane fields, and the ravine woods are completely isolated at the ravine rim from other such ecologies, if they even still exist in this area. *A. b. scelestus* was exceptionally abundant in this particular and very restricted strip of riverine gallery forest. Elevations above ground recorded for sleeping *scelestus* range from 2 to 20 feet (0.6 to 6.1 meters), with juveniles usually sleeping much lower than adults. The altitudinal distribution of *A. b. scelestus* is in general low, with recorded elevations from sea level to 200 feet. It is likely that this subspecies also occurs in the uplands of the Cordillera Oriental, but as yet there are no specimens from areas within that rather low-lying but mesic and well-forested massif.

The name *scelestus* is from the Latin for "unlucky, wretched," in allusion to the difficulties involved with collecting this subspecies at the La Romana ravine noted above.

The transition between *scelestus* and *litorisilva* must be very abrupt; the two subspecies are known from localities separated by only 28 kilometers. The habitats of the two subspecies are quite different, with *scelestus* inhabiting very mesic situations

and *litorisilva* xeric coastal woods. Interestingly, this same eastern region of the República Dominicana is also an area of abrupt changes in subspecies of *Anolis distichus*, where the subspecies *ignigularis* Mertens and *properus* Schwartz have ranges which coincide rather closely with those of *scelestus* and *litorisilva* (see Schwartz, 1968: 275, map). The question of intergradation between *scelestus* and the southwestern subspecies next to be named will be discussed under that taxon.

Perhaps more so than any other subspecies, *scelestus* seems to show a very spotty distribution. Two instances are worthy of mention. There are excellent extensive coastal forests at Cabo Caucedo south of the Aeropuerto Internacional de las Américas on the southern Dominican coast. Repeated diurnal and nocturnal visits to these splendid woods yielded no *A. baleatus*, despite what seems to be more than adequate habitat. A second locality, east of Boca Chica along the same coast, likewise supports extensive fine stands of lowland hardwood forests, and there also, despite many diurnal and nocturnal visits, we have never encountered *A. baleatus*. It is possible that these two instances of fairly dry coastal woods are not suitable for *scelestus* (whereas they surely would be for *litorisilva*) and that *scelestus* simply does not occur there.

#### *Anolis baleatus fraudator* new subspecies

*Holotype.* USNM 193978, an adult female, from 4 km W, 6 km N Azua, Azua Province, República Dominicana, one of two taken by Richard Thomas, on 23 July 1969. Original number V21384.

*Paratypes.* ASFS V21385, same data as holotype; ASFS V21433, Barreras, Azua Province, República Dominicana, native collector, 25 July 1969; ASFS V723, 1.1 mi. (1.8 km) S San José de Ocoa, 1400 feet (427 meters), Peravia Province, República Dominicana, R. F. Klinikowski, 24 August 1958; ASFS V21203, Sierra Martín García, about 3000 feet (915 meters), above Bar-

reras, Azua Province, República Dominicana, R. Thomas, 20 July 1969; ASFS V31207, Sierra Martín García, above Barreras, between 2000 and 2800 feet (610 and 854 meters), west slope, Mt. Busú, Barahona Province, República Dominicana, B. R. Sheplan, 15–17 September 1971.<sup>1</sup>

*Definition.* A subspecies of *A. baleatus* characterized by the combination of modally 4 scales at level of the second canthal scales, 6 vertical rows of loreal scales, 2 or 3 scales between the supraorbital semicircles, 4/4 scales between the interparietal and the supraorbital semicircles, high number of vertical dorsal scales (17–21; mean 18.8), low number of ventral scales (18–26; mean 20.7), nuchal scales high, body crest scales moderate in only adult female, subocular scales usually separated from supralabial scales by one row of scales; dorsum (in female) mottled pale and darker gray, with three irregular white crossbands, and blotched with yellow-green, top of snout and lores straw, labials dull yellow, and dewlap nearly white with a yellowish or cream wash.

*Distribution.* The Sierra Martín García in Barahona and Azua provinces, and along the southern slopes of the Cordillera Central and the Sierra de Ocoa in Azua and Peravia provinces.

*Description of holotype.* An adult female with a snout-vent length of 133 and tail length of 244; snout scales between second canthals 4; 6 vertical rows of loreal scales, 2 scales between supraorbital semi-

<sup>1</sup> Since the present manuscript was completed, a juvenile female (MCZ 132301) with a snout-vent length of 57 mm, was secured by E. E. Williams and J. Roughgarden at a locality south of La Horma, Peravia Province, on 19 July 1972. This lizard is to be considered a paratype. It has 3 snout scales at the level of the second canthals, 6 loreal rows, 3 scales between the supraorbital semicircles, 5/5 scales between the interparietal and the semicircles, 16 vertical rows of dorsal scales and 20 rows of ventral scales, and 1 scale between the suboculars and the supralabials. Both nuchal and body crest scales are low. As preserved, the lizard is dull greenish with indications of dark dorsal crossbars, and it lacks any pale dorsal markings.

circles, 4/3 scales between the interparietal and the supraorbital semicircles, vertical dorsals 17, horizontal dorsals 24, ventrals 21, subocular scales separated from supralabial scales by one row of scales, fourth toe lamellae on phalanges II and III 33, nuchal crest scales high, body crest scales moderate; in life, dorsum mottled pale and dark gray, blotched with yellow-green and with three irregular white crossbands, labials dull yellow, top of snout and lores straw, and dewlap nearly white with a yellowish or cream wash.

*Variation.* The only adult is the holotype; the remainder of the paratypic series is composed of juveniles and subadults with snout-vent lengths between 74 and 96 (three males, two females). Snout scales at the level of the second canthals range between 2 and 4; the mode is 4 (four specimens). The vertical loreal rows vary between 5 and 7, with a mode of 6 (three specimens). There are 2 or 3 scales between the supraorbital semicircles; both categories have the same frequency. There are modally 4/4 scales between the interparietal and the supraorbital semicircles; 4 scales are involved in 67 percent of the combinations; actual counts are 3/4 (2), 4/4 (3), and 5/6 (1). Vertical dorsals range between 17 and 21 (mean 18.8), horizontal dorsals between 20 and 24 (21.4), and ventrals between 18 and 26 (20.7). The only adult specimen (a female) has the nuchal crest scales high and the dorsal body crest scales moderate. Five specimens have the suboculars separated from the supralabials by one row of scales and one lizard has these scales in contact (17 percent).

The details of the color and pattern of the only adult, the female holotype, have already been given. The juveniles and subadults show the same general pattern configuration as does the adult. The smallest juvenile (snout-vent length 72), a female topotype, was gray with yellowish mottling and a pattern of three irregular crossbands, a faint white scapular stripe, and black postauricular and postorbital

spots. The dewlap was charcoal with white scales. The next largest individual (snout-vent length 74), a male, had the dorsum pale green with irregular transverse barring; the upper surfaces of the limbs were pale green and gray-green, and the tail was banded pale green and gray-green. The venter was whitish. The dewlap was very dark yellowish with an orange wash posteriorly. A slightly larger male (snout-vent length 85) was pale green, much marbled and shaded with tan to gray and with some faint evidence of transverse crossbands; the chin and throat were gray-green, and the dewlap pale grayish orange. A female from the Sierra Martín García (snout-vent length 88) was green and brown dorsally and without pale markings; the dewlap was marbled with charcoal. Finally, the largest subadult (snout-vent length 76), a male, had the dewlap dirty yellow with orange streaking. In the case of *fraudator*, the very pale (almost white) adult female dewlap appears to be preceded ontogenetically by brighter and more typically *A. baleatus* hues.

*Comparisons.* No other subspecies of *A. baleatus* approaches the pale colors of *fraudator*, nor does any other subspecies have such a pale dewlap. Although *fraudator* combines the blotching and transverse crossbands in the same fashion as does *scelestus*, *fraudator* is in all ways a paler lizard. Comparisons in details of color and pattern with all other subspecies of *A. baleatus* are unnecessary. *A. b. fraudator* differs from *samanae*, *scelestus*, *multi-*strupp**, and *sublimis* in having 4 rather than 2 snout scales at the second canthals, and only *fraudator* has a mode of 6 vertical rows of loreals (7 or 8 in all other subspecies). In having 4/4 scales between the interparietal and the supraorbital semicircles, *fraudator* differs from *caeruleolatus*, *scelestus*, and *baleatus*, all of which have 5/5. Although *fraudator* has a high mean (18.8) of vertical dorsals, in which it is exceeded only by *sublimis* (mean 19.2), *fraudator* has the lowest mean (20.7) of

ventrals of all subspecies, being approached most closely by *scelestus* (21.1).

*Discussion.* Apparently *A. b. fraudator* is a pale subspecies that is restricted to favored situations in the xeric regions associated with the Llanos de Azua along the southern slopes of the Cordillera Central and the Sierra de Ocoa, a southern affiliate of the former range. The subspecies apparently also occurs in the Sierra Martín García, an eastern isolate of the Sierra de Neiba (which, it will be recalled, is elsewhere occupied by *A. r. ricordi*) and surrounded by extreme desert. The specimen from Barreras, which lies at the foot of the Sierra Martín García, is interesting in that it seems a most unlikely locality for any giant anole; however, I assume that the specimen, which was native-collected, was taken either in nearby *Cocos* groves or on the lower wooded slopes of the range itself. Two specimens from the higher elevations of the Martín García are from dense woods, and the specimen from San José de Ocoa was taken from a large tree at the edge of a pasture. The type locality is semi-xeric woods with vine tangles and mango trees in an otherwise cultivated but xeric region. Probably *A. b. fraudator* is widely distributed in suitable situations through much of this region, but the lizard appears to be rare; Buffett and I collected in semi-mesic riverine woods at a locality 4 km W and 17 km N Azua at an elevation of about 500 feet (153 meters), both during the day and at night, without seeing any giant anoles. Natives just south of San José de Ocoa at an elevation of 1400 feet (427 meters) did not secure specimens for us in semi-mesic woodlands. Since the altitudinal distribution of *fraudator* extends from sea level to about 3000 feet (915 meters) in the Sierra Martín García, the elevations of the above-mentioned localities are within the known altitudinal range of the subspecies, and indeed our San José de Ocoa locality was quite close to where Klinikowski secured one of the paratypes.

*Remarks.* The name *fraudator* is from the Latin for "deceiver" in reference to the

resemblances between this subspecies and *A. barahonae*. In fact, my decision to regard *fraudator* as a subspecies of *baleatus* rather than *barahonae* is based more upon the juveniles than the adults of *fraudator*; this is not exclusively due to the fact that there are more juveniles of *fraudator* than adults but rather that the patterns shown by juvenile *fraudator* are more typically those of *A. baleatus* than of *A. barahonae*. *A. b. barahonae* and *A. b. fraudator* are alike in modal numbers of scales at the level of the second canthals (4), vertical loreal rows (6), and scales between the interparietal and the supraorbital semicircles (4/4), and they do not differ strikingly in means of body scales (17.2, 18.8 in vertical dorsals; 18.2, 21.4 in horizontal dorsals; 22.1, 20.7 in ventrals). In these means, *barahonae* is lower in dorsal body counts, but higher in ventral counts. The moderate nuchal crest scales of *fraudator* occur also in *barahonae*, but most female *barahonae* have these scales low. No female *barahonae* has moderate dorsal body crest scales as does the female *fraudator*, whereas moderate body crest scales occur in females of most subspecies of *A. baleatus* (only female *sublimis* lack them). Taking all evidence into consideration, I have elected to consider *fraudator* a subspecies of *A. baleatus*, but its resemblances to *A. barahonae* are acknowledged. The distance separating these two species in this area is only 20 kilometers (see introduction), and it is not unlikely that *A. barahonae* has been derived from *fraudator* across the strait that is now the Valle de Neiba (see discussion). On the other hand, *A. b. fraudator* is removed by some 60 kilometers from the nearest *A. ricordi* locality in the nearby Sierra de Neiba. There is no question that *fraudator* is not correctly associated nomenclatorially with *A. ricordi*.

The apparent geographic isolation of *fraudator* in relation to other subspecies of *A. baleatus* is probably artificial. The nearest records for other subspecies are: *caeruleolatus*—38 kilometers (San José de Ocoa and La Cumbre); *scelestus*—55 kilo-

meters (San José de Ocoa and Yamasá); and *sublimis*—50 kilometers (San José de Ocoa and south of El Río). There are suitable habitats for giant anoles between *caeruleolatus*, *scelestus*, and *fraudator*, but specimens are lacking. The intervening high Cordillera Central between the ranges of *sublimis* and *fraudator* probably acts as a barrier to prevent contact between these two subspecies.

## DISCUSSION

My decision to consider *Anolis ricordi* as three species rather than one has some precedent in the Schwartz and Garrido (1972) treatment of the Cuban *Anolis equestris*, wherein that species was divided into five species. However, the two situations, although comparable, are far from identical. In the *A. equestris* complex, there are at least a few incidences of sympatry between members of the species-complex which give clues to the facts of the situation; there are strong differences in size of dorsal scales; there are some strong differences between details of pattern and coloration of the axillary stripe and the dewlap which likewise suggest that we are there dealing with more than one species. But on the other hand, the Hispaniolan giant anoles show absolute differences in the nuchal and body crest scales and differences in the pattern of the body itself, as well as modal differences in scutellar details. In addition, there are no cases as yet known in Hispaniola of sympatry between the three entities that I regard as full species. The gaps between them are narrow, however, and I feel strongly that it is merely a matter of getting into the intermediate areas and, once there, being fortunate enough to encounter giant anoles.

It should be obvious from my systematic treatment that I am convinced that we are dealing in Hispaniola with three distinct species—*ricordi*, *barahonae*, and *baleatus*. Surely the differences between *ricordi* and *baleatus* are such that, when taken in sum, one has no doubts that he is involved with

two very different animals. The differences here are much greater, for instance, than between *Anolis distichus* Cope and *Anolis brevirostris* Bocourt, two species that were long confused and that resemble each other morphologically to a very great degree. Yet once one learns what the characters are for separating them, he experiences little difficulty in dealing with both populations or individuals, either allo- or sympatric, of these two species. The differences in life, as far as pattern and color are concerned, are not particularly subtle, and the details of scutellation are not dichotomous, but the modal differences are so well correlated with the pigmental and pattern traits that we now recognize these two species with assurance.

An even more obvious parallel is *Anolis carolinensis* Voigt and *Anolis allisoni* Barbour in Cuba. These two species of green anoles, long confused as *A. porcatius* Gray (or *A. c. porcatius*), were shown by Ruibal and Williams (1961) to be a sibling pair, fairly allopatric but both widely distributed throughout much of Cuba, and to differ structurally by the condition of the postauricular area. The presence (*allisoni*) or absence (*carolinensis*) of a deep and elongate postauricular groove in these two species is correlated with very striking differences in adult pattern and coloration and other details of scutellation.

The same situation, that of two species masquerading under a single name, can also be demonstrated in *Anolis alutaceus* Cope and *Anolis clivicola* Barbour and Shreve (Schwartz and Garrido, 1971), and the two species recently confused under *Anolis spectrum* Peters; both these situations pertain to Cuban species. Sr. Garrido also advises me that he has much evidence to indicate that *Anolis cyanopleurus cupeyalensis* Peters is in fact a sympatric sibling, rather than a subspecies, of *A. cyanopleurus* Cope.

I could cite other examples in Antillean iguanids (*Leiocephalus*) and anguids (*Diploglossus*) which demonstrate quite clearly the above trend. As more material

from more diverse localities becomes available, and as this material is subjected to re-evaluation with differing and more modern philosophies, our impressions of relationships among Antillean anolines have been modified or changed. A major factor in such revisions has invariably been a great quantity of new material from areas that had previously been unsampled, coupled with pigmental, ecological, and ethological data from the living specimens. A second general line of evidence, equal to or possibly surpassing morphological and distributional data in importance, is karyotypic and electrophoretic information. One or both of these areas of investigation are increasing our knowledge of the complexities within such a genus as *Anolis*. When these two areas of research—morphological and biochemical—can be brought to bear simultaneously upon a single species or species complex, the results may be even more meaningful than either is alone. As yet this has not been done in any of the Antillean giant anoles, so that my conclusions, based upon morphology and distribution, remain to be verified by other evidence. Yet I feel as secure as any systematist can be when he is dealing with data that are incomplete.

As pointed out in the introduction to the present paper, the taxa *ricordi*, *baleatus*, *barahonae*, and *leberi* are, on inspection, unequivocally distinct. But the degree or level of differentiation of these four taxa seems to be two-fold. On one hand (*ricordi* and *baleatus*), the two populations are easily separable on the basis of a structural feature (the nuchal crest scales), a character that is strongly correlated with obvious pigmental and pattern traits. On the other hand, the differences between *barahonae* or *leberi* and *ricordi* are primarily ones of pigmentation and pattern, with morphological differences much less trenchant than between *ricordi* and *baleatus*. At the outset such a dichotomy suggests that it might be more proper to consider "A. *ricordi*" as a complex of full species than as one species with four (or

more) subspecies. Apparently Williams and Rand (1969) had the same inclinations, since they indicated that the differences between some of the then-named populations of *A. ricordi* were such as to suggest that there might be more than one species involved.

Once the above assumption has been made—namely, that *A. ricordi* is composed of more than one species—then the problem first becomes one of differentiating and delimiting the component species. There is no difficulty here in separating *A. ricordi* and *A. baleatus* on the basis of crest scales. None of the populations of *A. baleatus* has the moderate (rarely) to low (usually) nuchal crest scales of *A. r. ricordi*. In addition, the narrow geographical gaps that exist between *A. ricordi* and *A. baleatus* also suggest that these two taxa may be either allopatric or may meet and occur sympatrically without intergradation.

The status of the Tiburon populations that I associate nomenclatorially with *A. ricordi* and that of *A. barahonae* as a distinct species are less clear than the *ricordi-baleatus* relationship. First, the named populations *leberi*, *viculus*, and *subsolanus* have in common a suite of pattern and color features that ally them more closely to each other than to *A. r. ricordi*. The only evidence for this relationship is the occurrence of presumed *viculus* × *ricordi* intergrades in the Miragoâne-Paillant region. Were it not for these specimens, I would be strongly tempted to consider the three Tiburon taxa as comprising a separate species. Any interpretation of the relationships of the Tiburon taxa suffers from paucity of material from a variety of localities.

The situation with *A. barahonae* is in some ways puzzling. Although there is no question that it is distinct from *A. ricordi*, its relationships to *A. baleatus* are much less certain. This uncertainty is caused by *A. b. fraudator*, that population assigned to *A. baleatus* which is closest geographically to *A. barahonae*. It is particularly unfortunate that *fraudator* is known from only

one adult and several juvenile and subadult specimens, since adult males (primarily) would be most instructive in comparing *fraudator* with *barahonae*. On the other hand, the closeness of *fraudator* and *barahonae* in characteristics may be rather a reflection of the ancestry of *A. barahonae*—namely, that it is a south island (*sensu* Williams, 1961) invader from the north, and that the parent population has been *fraudator* rather than any other subspecies of *A. baleatus* or *A. ricordi* from the west.

It might be more proper either to consider *A. barahonae* as conspecific with *A. baleatus* (the two taxa linked through *fraudator*), or to consider *fraudator* a subspecies of *A. barahonae*; either interpretation has merit. The course that I have taken seems satisfactory at the moment but surely is subject to reinterpretation with the acquisition of more material from this critical geographic area.

The history of the Hispaniolan giant anoles appears to be correlated with the two palaeo-islands that have been fused at the level of the Cul de Sac-Valle de Neiba plain with lowering Pleistocene sea levels. I suggest the following history for the complex; the reader should keep in mind that such a history is based upon taxonomic premises that are inductive, and the cautions and uncertainties that I expressed above have special application here.

Distributional evidence suggests that the giant Hispaniolan anole stock was originally restricted to the north island (north of the Cul de Sac-Valle de Neiba plain). In this region, two distinctive species arose, *ricordi* in the west and *baleatus* in the east. There apparently has been local differentiation on the north island at a subspecific level in both these species, but that in *ricordi* remains unanalyzed because of too few specimens. On the other hand, differentiation in *A. baleatus* is now fairly well known and documented. This species occurs east of the Cordillera Central and on the southern slopes of that range and in the Sierra Martín García. There have been

local population differentiations in response to the various ecologies within the area occupied, with two major integumental trends (coloration and pattern) and details of scutellation of the head and body (although the latter is not so clear as the former).

There seem to have been two subsequent invasions of the south island. To the west, a (presumably) early invasion of the *A. ricordi* stock crossed what is now the Cul de Sac Plain into the Port-au-Prince area. It is pertinent that many north island species have made this same crossing and have extended their ranges but little further. These species with more restricted ranges have been handicapped either by competition with already established species, improper ecological situations, or relatively recent arrival. *A. ricordi* seems to have been an early arrival, without local competitors, and with abundant proper ecology (mesic forests). The species has thus expanded its range after the original crossing to cover the entire Tiburon Peninsula, having somewhere succeeded in crossing the mountainous spine of the Massif de la Hotte-Massif de la Selle. Local differentiation along the Tiburon in response to lack of genetic contact across the interior mountains has also taken place. Further speculations on details of the history of *A. ricordi* on the Tiburon Peninsula are pointless, since the specimens upon which any generalisations may be made do not as yet exist in collections.

A second invasion to the east occurred presumably at a later date, after the establishment of *A. ricordi* on the Tiburon Peninsula. This latter invasion resulted in the differentiation of *A. barahonae* (from a *fraudator* or pre-*fraudator* stock on the southern portion of the north island) in the Sierra de Baoruco and its subsequent expansion onto the southern portion of the Península de Barahona and east along the southern slopes of the Sierra de Baoruco. With the previous establishment of *A. ricordi* to the west (as at Thiotte), the western movement of *A. barahonae* was



halted by the presence of the related species. I have no doubt that both *A. ricordi* and *A. barahonae* will be found to be closely allopatric or sympatric in extreme southeastern Haiti between the Dominico-Haitian border and Saltrou, and also that these two species meet and interact along the northern slopes of the Sierra de Baoruco and the Morne des Enfants Perdus.

One other distributional detail requires comment. The occurrence of *A. r. ricordi* in the main mass of the Sierra de Neiba on the northern side of the Valle de Neiba and of *A. b. fraudator* in the Sierra Martín García, an extreme eastern isolate of the Sierra de Neiba, has already been noted. The Martín García seems to have been long isolated from not only the Sierra de Neiba but also from all other Hispaniolan mountain masses; it is ideally a montane island in a sea of desert. It seems likely that this range was unoccupied by giant anoles of either species (*A. ricordi* or *A. baleatus*), despite the fact that the range forms a portion of the Neiba uplift. Invasion of the Martín García was possible from either the northwest (*ricordi*) or the northeast (*baleatus*). Of the two species, *A. baleatus* was the more vagile and reached the Sierra Martín García from the relatively more mesic southern slopes of the Cordillera Central before *A. ricordi* reached it across the deserts and xeric hills between the Sierra de Neiba and the Martín García. This upland population in turn was responsible for the invasion of the Sierra de Baoruco across the better forested and more mesic eastern end of the Valle de Neiba.

Wetmore and Swales (1931: 235) reported the finding of recent *Anolis ricordi* skeletal material in Barn Owl (*Tyto alba*) pellets from L'Acul, Dépt. du Sud, Haiti, on the Tiburon Peninsula, and Hecht (1951: 23) noted the abundant remains of the species from deposits in "Deep Cave," near St. Michel de l'Atalaye, Dépt. de l'Ar-tibonite, Haiti. Etheridge (1965: 101) reported *A. ricordi* remains from recent owl pellets near the mouth of a cave near Boca

de Yuma, La Altagracia Province, República Dominicana. Etheridge (*op. cit.*: 87–88) also noted pre-Columbian giant anole remains from a cave at Cerro de San Francisco near Pedro Santana, La Estrelleta Province, República Dominicana. From the suite of about 80 cranial elements and eight pelvis, Etheridge extrapolated that the maximally sized individuals in the cave deposits had a snout-vent length of 190–192 mm, some 30 mm larger than any living *A. ricordi* recorded (159 mm, *vide* Etheridge, *op. cit.*: 88). The maximally sized Hispaniolan giant anole recorded in the present paper reaches a length of 180 mm (male *A. b. scelestus* from Otra Banda, La Altagracia Province, República Dominicana). The difference between this modern living lizard and the maximally sized pre-Columbian lizards is not so great as Etheridge's data suggest. Intriguingly, the Cerro de San Francisco area lies within the known range of *A. r. ricordi*, and the largest specimens of this subspecies (male with a snout-vent length of 160 mm, female 151 mm) are from the southern slopes of the Cordillera Central, very close to the Cerro de San Francisco area. Although there seems to have been some change in maximum size in Hispaniolan giant anoles with the passage of time, these changes have not been of the magnitude that previous data suggested.

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